THE HEATING AND VENTILATING MAGAZINE

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The Ventilation of Court Rooms and Halls of Justice

BY WILLIAM J. BALDWIN

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There is probably no class of men who suffer more for the want of pure air than our judges and the officers and men who go to constitute our civil and criminal courts of justice. These men are in their courtrooms at nearly as early an hour as the mechanic who goes to his daily toil under the modern hours of labor, and almost without intermission they devote more hours to their court duties than the ordinary mechanic; often, when the exigencies of the court require it, working into the night, doing overtime for which there is *no double pay*.

The law in the state of New York requires that a schoolroom shall be ventilated and that each child shall have at least 1,800 cu. ft. of fresh air per hour, calling for about 100,000 cu. ft. of fresh air per hour in an ordinary schoolroom of about 24 ft. by 32 ft., containing between forty and fifty scholars.

These conditions are for only a three-hour session in the morning and for a two-hour session in the afternoon, for five days a week, and there is nearly a three months' vacation in the summer, with approximately two weeks' vacation in the winter, and a number of other holidays. This is good, and it goes to show that the child has been remembered by our lawmakers, and that incidentally the teachers get some fresh air also, as the mandate of the law seems to have forgotten the teachers.

There is no law, however, that for each legislator at Albany a certain per capita shall be provided in the legislative halls. He seems to have forgotten himself. He has also forgotten the inmates of all public institutions; and were it not that there is a kind of tacit law, founded on the writings and requirements of eminent sanitarians, our hospitals and asylums would be practically without ventilation, and in fact a great number of them have only *accidental ventilation*. In other words, they receive fresh air only in so far as the fresh air becomes a *vehicle* to carry heat and warmth into the building.

In any room or auditorium in which a number of persons are congregated it is the rule, and scarcely ever the exception, that the quantity of air admitted is only sufficient to warm the room, and with the comfortable warming of the room the amount of air entering the room is limited—in fact, the air supply has to be limited or stopped—otherwise the air of the room would become too warm.

Now, where this may do for a large room in which there are a few persons, it will never do for a crowded room, for a schoolroom or a courtroom.

ACCIDENTAL FRESH AIR

The larger the room, also, the *proportionally* smaller *the amount* of

"accidental" fresh air that comes into it; and by *accidental fresh air* I mean the air that is "the vehicle of the heat." This is an absolute fact and never to my knowledge pointed out in any work on ventilation and warming.

Like all cubes, the outside surfaces (the cooling surface and the windows) vary very rapidly in proportion to the cubical contents; in fact, the cooling surface is in the *ratio of the square,* while the cubical contents are in the *ratio of the cube.* Therefore, when the effort is only to keep a room warm by carrying heated air into it (fresh or stale), the smaller the room the greater *relative* percentage of air there is carried into it.

For small offices or living rooms enough air may be supplied to the rooms in this manner, but in the matter of large rooms like courtrooms the percentage falls *so low* that if we take an ordinary office room of 2,000 or 3,000 cu. ft. and compare it to a courtroom of 75,000 to 100,000 cu. ft., the small room is getting from three to six times as much fresh air *per unit of floor space* as the large room is receiving.

These are the conditions that prevail in the courthouses of Greater New York.

LESS AIR TO A LARGE ROOM

The warmth necessary for a room is never in proportion to its cubic contents, but is always in the direct ratio of its outside walls and its windows. Therefore, the larger the room, such as courtrooms or other auditoriums, the smaller the actual proportion of air they will receive to a unit of their cubic contents.

Let us consider *the unit of their cubical contents* as the floor space comfortably necessary for each person for the purpose for which the room is to be used, with the space above the individual as far as the ceiling.

To prove this, let us imagine two ordinary rooms 10 ft. in height, one a room 10 x 10 ft. and containing 1,000 cu. ft. of air; the other a room 20 x 20 ft. and containing 4,000 cu. ft. of air. If we assume them to be corner rooms, the smaller room, of 1,000 cu. ft. of air, has two outside walls with an aggregate area of 200 sq. ft., while the larger room, of 4,000 cu. ft. of air, has outside walls of only 400 sq. ft.; so that the larger room has but one-half the cooling surface *per unit of capacity* of the smaller room, and therefore would receive only one-half as much air *per unit of cubic contents* when the air is simply a *vehicle* for the heat.

This explains the condition that exists with ordinary indirect radiation, where the air is, as I stated before, used for no other purpose than as a vehicle for heat. This is the condition that exists in many of our old school buildings to-day, even in spite of our laws, as I believe the laws are not retroactive.

It is the condition also that exists in nearly all our courthouses the country over. It is the universal condition, and is accountable for more dissatisfaction than any other single cause in large and crowded chambers. It applies particularly to our courtrooms and halls of justice.

AIR PROPORTIONAL TO THE OCCUPANTS

Many of our modern auditoriums, such as the new theaters, opera houses and academies of music, have *systematic ventilation,* whereby the fresh air is proportionate to the number of occupants, and is only incidental to the warming of the building. The warming of buildings should be another question.

Why these methods are not applied to our office and public buildings is the important question. The science, of course, is comparatively new, and it is also very imperfectly understood, except by a very limited number, and when it is sometimes understood, it is set aside for "architectural reasons."

HOW SHOULD A COURTROOM BE VENTILATED?

The question will naturally arise, "How should a courtroom be ventilated?"

In cold winter weather it has, of course, also to be warmed, and in America the custom has been to make the ventilating apparatus also do the

warming for the building. This is the great error.

The ventilating apparatus and the warming apparatus should never be the same, except perhaps in private houses or in rooms where the number of occupants is comparatively small, so that the amount of air necessary for warming is also sufficient for ventilation.

This can never be the case in a crowded room. It can never be so in a schoolroom, and one of the surest simple tests for a layman, if he wanted to prove whether the schoolroom or any other crowded room is properly ventilated in cold weather, is to hang a thermometer on the face of the heat register and note the temperature at which the air enters the room.

If the air is passing the register at 100° or 110° or higher, he is justified in declaring absolutely the room is not properly ventilated, and you will ask why. Because if sufficient air was entering the room at the temperature at which it passed the register, the room would have a temperature of 100° or more in less than an hour, and the condition could not be tolerated.

AIR FOR A SCHOOLROOM

If 100,000 cu. ft. of fresh air is let into a schoolroom in an hour at a temperature of 110°, the temperature of the room will probably be 100° F. at the end of the hour, and the registers must be closed to regulate the heat, thus cutting off the air supply, and if the air supply is cut off, until the temperature of the room can be tolerated, then the room is not receiving anything like its quota of air; probably not one-quarter its quota.

TEMPERATURE OF AIR PASSING THE REGISTERS

The fresh-air supply for a schoolroom in neighborhoods with temperatures somewhat similar to New York City should never pass the registers at more than 20° above the temperature at which the room is to be maintained, if the quantity of air required by law is admitted, and in moderate winter weather, if the room is to be kept at 70°, the temperature of the air at the register will be as low as 80°, and should be no higher.

This simple test is suggested for any school principal or teacher.

The question again is "How should an auditorium or schoolroom be ventilated and warmed?" It should be warmed by simple direct radiation of sufficient capacity to raise the temperature of the room to 68° F. in cold weather.

The direct radiation, of course, is not a ventilator; it is a warmer, and, this being the case, what about the ventilation?

The air for ventilation should enter the room through a set of registers and from *an entirely separate source of heat,* and the air should enter the room not more than 2° to 4° warmer than the temperature at which the room is to be maintained.

It may be asked, "Why 2° warmer than the temperature at which the room is to be maintained?" The answer is that when the air enters the room at the temperature already colder than the air of the room, the entering air will fall on the heads of the persons and make draughts. Therefore, it should enter a little warmer than the air of the room and rise to the ceiling and then diffuse.

There is economy also in separate systems; that is, *separate direct radiation for warmth and tepid fresh air for ventilation's sake* alone.

VENTILATION NECESSARY IN SUMMER

Ventilation is as necessary, perhaps more necessary, in summer than in winter, as the air is less dense and consequently more easily vitiated. I do not wish to be understood as saying that *systematic* ventilation can be much of an improvement upon opening all your windows in June or July or August, and allowing the air to blow in at one side of the house and out at the other. I do say that a good ventilating apparatus should give results almost equal to those of June or July, though the season may be December.

In many of our hospitals there is a theory that windows cannot be opened when the ventilating apparatus is in

use. If the ventilating apparatus is properly constructed this is not a fact, although it is often the case through improperly constructed heating and ventilating apparatus.

The fans of a ventilating apparatus should be kept running in summer just as well as in winter, regardless of whether the windows and doors are open or shut.

No ventilating apparatus should be designed in a manner that opening or closing the windows could have anything to do with its operation, and when an apparatus is properly designed and constructed, the opening or closing of the windows or transoms or doors into the halls will have no effect upon its efficiency or operation.

WINDOWS CAN BE OPENED

I know the idea has gone abroad that when the fans are running the windows should not be opened, and many of the elaborate apparatus are so designed, but it is quite obvious that this is not good practice.

To return again to the court-room, it is obvious the court-room should be treated very much as a school-room should be treated. The best practice in schools is to warm by direct radiation and to ventilate *independently* and to move the air in quantity (ventilate) only during the hours of occupancy. This is also in the interest of *economy of maintenance.*

In the matter of a court-house or court-room this should be modified to the exigencies of the requirements. In other words, there should be a reasonable amount of direct radiation sufficient to keep the building comfortably warm at all times, but no more. There might be a sub-system of ventilation that could be always in use, admitting a minimum of fresh air, and there should be a *ground system,* whereby air can be admitted almost *ad libitum;* this latter to be used when court is in session.

It is possible also, to one acquainted with the modern technique of this subject, to arrange it so the judge at his desk can vary the temperature and the amount of air admitted to his court-room *by a simple switch upon his desk,* and not have to call the attention of an attendant.

If he has *two* little switches on his desk, *one* to control *the heat* and the other to regulate *the amount of air* (ventilation), he can modify the conditions to his feeling and according to his judgment.

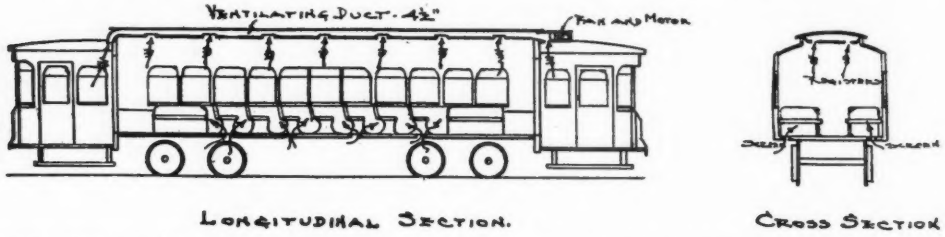
Types of Street Car Ventilating Systems

I—THE COOKE SYSTEM.

The accompanying illustrations show the method that has been adopted for heating and ventilating 350 cars of the Chicago Railways Company. It is known as the Cooke system of ventilation and has been recently patented.

This system is designed to exhaust the vitiated air by means of a motor-driven fan connected to an exhaust chamber in the roof of the car. Fresh air is drawn in through the lower part of the car body and distributed by ducts which terminate at electric heaters under the car seats, thus affording a means for continuously tempering the air.

The general arrangement of the



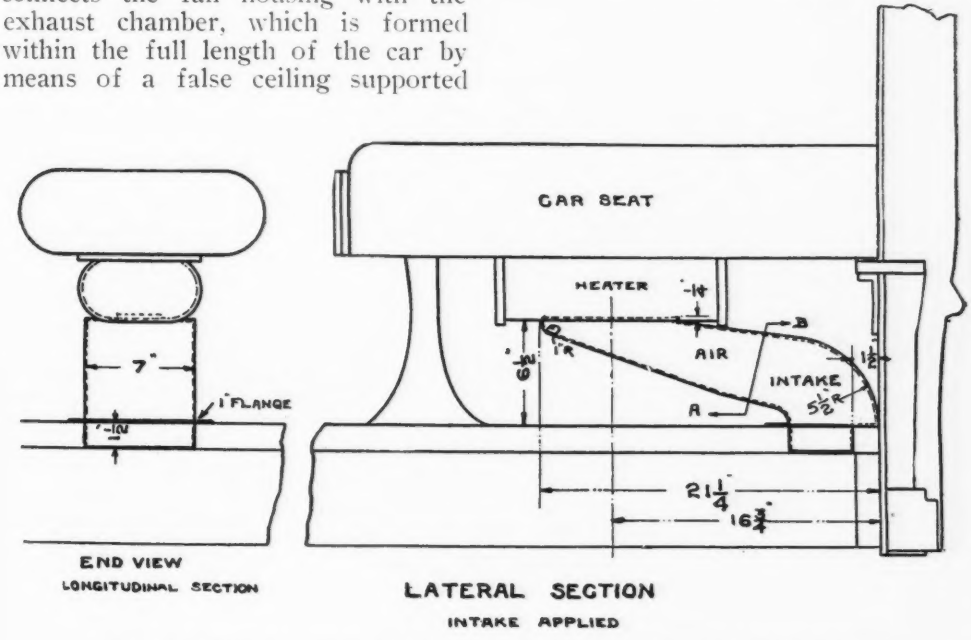
COOKE SYSTEM OF CAR VENTILATION AS APPLIED TO "PAY-AS-YOU-ENTER" STREET CARS

air-handling devices may be seen from the accompanying cross sectional view of a street car equipped with this system. Four fresh-air intakes, each 4 in. x 7 in. in size and protected by wire screens, are cut through the floor of the car on each side close to the wall. With the partial vacuum mechanically maintained inside the car, fresh air is continually drawn in through these screened openings, and as it enters passes between the coils of the electric heaters mounted under the car seats. The respective areas of the fresh-air intakes and the exhaust ports are proportioned so as to permit the passage of air at a velocity so low that its movement is imperceptible; and yet the amount of air drawn in, heated and exhausted, is sufficient to change the body of air within the car often enough to maintain a standard of purity well within sanitary limits.

Vitiated air is exhausted by a motor-driven fan permanently mounted on the top of the vestibule roof close to the monitor deck. The intake for this fan and the fan housing are made of sheet copper so designed that the exterior does not detract from the appearance of the car. Only one fan is used. A cone-shaped duct connects the fan housing with the exhaust chamber, which is formed within the full length of the car by means of a false ceiling supported

"PAY-AS-YOU-ENTER" STREET CAR EQUIPPED WITH COOKE SYSTEM OF VENTILATION

4½ in. below the main ceiling. This exhaust chamber extends for the full width of the monitor deck and connects with exhaust outlets in each vestibule. It is continuously kept under a partial vacuum by the motor-operated fan. The vitiated air from within the car body and the vestibules enters the exhaust chamber



ARRANGEMENT OF AIR INTAKES UNDER CAR SEATS, WITH COOKE SYSTEM

through fourteen 5¾-in. register openings in the body of the car and 2-in. x 12-in. screened openings, one in each vestibule. The registers fitted into these openings are located on 4-ft. 6-in. centers, and each register is provided with a damper mechanism, so that the air velocity through each exhaust port may be equalized, irrespective of its distance from the fan.

This system of ventilation is said to provide an even and constant circulation of air throughout the car, which is in no way affected by the speed of the car, direction of motion of the car or the wind pressure. The motor which operates the exhaust fan is controlled by a snap switch within easy reach of the motorman.

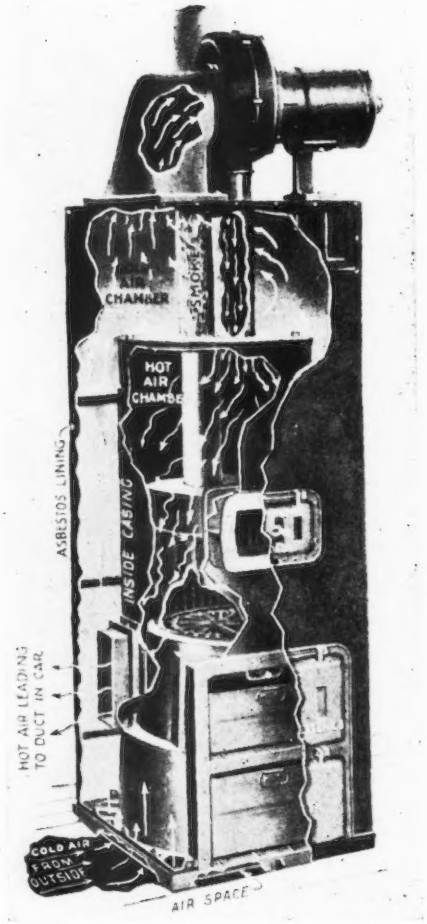
II.—THE PETER SMITH CAR VENTILATOR.

A recent test made in Detroit of the Peter Smith hot air forced circulation car heater has added much interest to this method of car ventilation. The test in question was made in a street car equipped with one of these devices, and among those present were Dr. E. M. Hayward, board of health chemist; Sanitary Engineer Williamson; J. D. Stoddard, chemical engineer for the Detroit Testing Laboratory; and E. H. Anderson, assistant smoke inspector.

The test was made, as far as possible, under the ordinary conditions, and the figures of the tests showed that with all doors, ventilators, and windows shut, the apparatus forced 220 cu. ft. of air per minute through a car with an area of 1,620 cu. ft. of air space.

As may be seen from the illustration, the Peter Smith apparatus is equipped with a small motor and blower located on top of the heater, near the front. The heater itself is placed in the forward vestibule of the car. The motor is connected to a trolley circuit and is controlled by a snap switch.

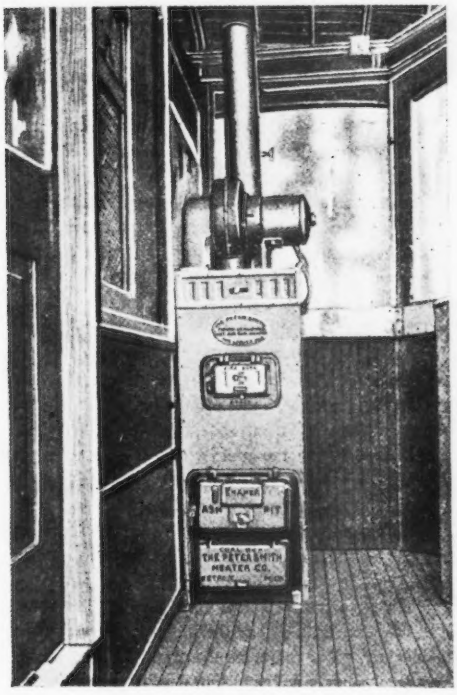
Starting the motor, to which the fan is direct connected, causes the latter to draw cold air from under the car body through an opening cut in the car floor and perforations in the base plate, upward between the walls of the cylindrical inner hot-air box and the square outer heater-jacket. Passing through the blower, the air is forced downward through a 5-in. pipe into the air-tight hot-air chamber surrounding the fire-pot,



SECTION VIEW OF THE PETER SMITH FORCED CIRCULATION HOT AIR CAR HEATER

from which the now heated air is forced out from the hot-air outlet at the bottom of the heater into a conduit running along one side of the car, next to the door, and out through 4-in. circular openings or registers placed at 3-ft. intervals under the car seats. The conduit pipe, rectangular in section, about 3x8 in., according to requirements, is made of light gal-

vanized iron, and runs from the front to the rear of the car along the truss plank and on the floor. The vents are placed in a gradually ascending line, beginning at the heater end, because this arrangement permits the emission of equal amounts of air throughout the car. The steady volume of hot air passes over the floor and then rises to the ventilators, thereby insuring an even distribution of heat and dry floors.

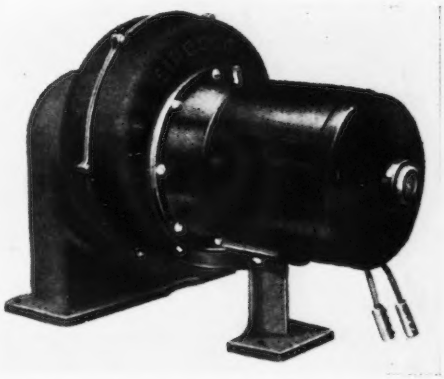


PETER SMITH HEATER COMPLETE INSTALLED IN VESTIBULE OF CAR

Although the draft at the outlets is not enough to inconvenience the passengers sitting over them, the blower pressure is sufficient to allow passengers on the other side of the car to enjoy its benefit. The duct outlets are screened to prevent passengers from throwing rubbish into them.

Under the longitudinal seats the duct is placed back far enough to prevent its being kicked by passengers. Where cross-seats are used, the duct lies on edge and is placed alongside each seat in a magnesia-lined wooden box.

Some interesting results were obtained with this apparatus in a test

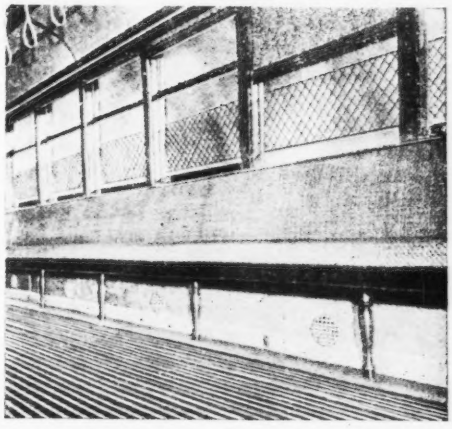


MOTOR DIRECT CONNECTED TO FAN USED WITH PETER SMITH SYSTEM OF CAR HEATING

made on a pay-as-you-enter car operated by the Municipal Traction Company of Cleveland.

In the first place, the experiments were made with the car standing still. The temperature of the air outside of the car was 20° F., and the fire in the heater was what would ordinarily be maintained under every-day conditions. The ventilators in the car were all closed. The thermometer showed a temperature in the front of the car, at the height of the bell cord, of 68°. In the center of the car, at the same height, 73°, rear 76°.

The ventilators still closed, the temperature was next taken at the height of the seat backs, which showed, at the front of the car, 66°; at the center of the car 71°, and at the rear of the car 73°.



ARRANGEMENT OF HOT AIR DUCT AND OUTLETS UNDER SEATS OF CAR EQUIPPED WITH PETER SMITH SYSTEM

The ventilators were then all opened. There were fourteen of them, each one with an opening of about 140 sq. in. After the ventilators had been open for some time, the temperature was again taken, and showed, at the height of the bell cord, in the front of the car, 56°; at the center 63°, and at the rear of the car 66°. At the height of the back of the seat the temperature showed, at the front of the car, 55°; at the center of the car 56°, and at the rear of the car 57°.

The car was then started and run for a long distance. While running at full speed, the front and rear doors were frequently opened so as to obtain the same amount of exposure to cold air that would be usual under normal conditions. Temperatures taken about midway on the run out showed 72° over the front bolster and 80° over the rear bolster at a 5½-ft. level. The temperature was also taken on the car floor, showing 56° at the front, 57° at the center, and 58° just in front of the rear exit door.

While these temperatures were being maintained, the air in the car was being changed every 6 minutes.

English Notes on the Ventilation of Workshops

By J. Roger Preston and Oswald Stott.

The ventilation of workshops can only be effected by automatic means if the floor area is small. It is usually accomplished, in the case of top floors, by fixing exhaust ventilators in the roof, and fresh air inlets round the outer walls or windows. For the floors beneath, inlets are fixed in the walls or windows about 7 ft. 6 in. from the floor, and the outlets are also fixed in the outer walls as high as possible. The warming may be by low pressure hot water, or steam, low or high pressure.

Cast or wrought iron pipes run round the walls are very usual and, from a warming point of view, give fairly satisfactory results. Better still are ventilating radiators over which fresh air from the outside atmosphere passes, and so is warmed and the ventilation of the room improved.

Ventilating radiators are merely ordinary radiators with the addition of metal baffles fixed between the loops, as they are called, of the radiator up to about three-quarters of its total height. An opening is provided in the wall behind near the bottom of the radiator, and thus a current of warm fresh air is caused to flow into the room. Any ordinary radiator, already fixed, may be transformed into a ventilating radiator by fixing sheet metal baffles and knocking a hole through the wall as described.

It would, at first, appear as though the fresh warm air would rise straightway to the highest point and depart through the outlets. This would be so if it were not for convection currents and diffusion, as previously mentioned; but a considerable part of the total incoming air must be wasted in this way.

Effect of Gas Jets on Automatic Ventilation

Where gas-jets are the illuminating medium it is practically impossible to obtain satisfactory ventilation by automatic means during the period they are alight, owing to the great quantity of air which would be necessary to maintain a satisfactory standard of purity, and the larger the floor area the worse the evil. We do not propose to dwell upon automatic ventilation, as it is not suitable for workshops in which there is a possibility of deleterious matter arising from processes of manufacture; unless these impurities are of such a volatile nature as to be much lighter than air, and also if given off in very small quantities.

Types of Mechanical Systems

The other method of ventilating workshops is by mechanical means.

Steam coils and gas jets are so utterly inefficient, as we have shown, that we shall not waste time upon them, and so we come immediately to the use of fans. The old method used to consist in fixing propeller fans in the roof or walls to exhaust from the workshop, inlets being provided in the outer walls, etc., and much improved ventilation was obtained as compared with automatic means.

With large floor areas it was found impossible to get fresh air to the centre of the building, and the usual method adopted nowadays is to have a central plant consisting of a fan, or fans, and suitable heating media. Sheet metal ducts are run along the shop, and at frequent intervals fresh air (warmed in water) is propelled from suitable openings.

These openings are either at the top of the room, or else, where convenient, branch ducts are carried to near the floor level and the fresh air introduced at that point. Where gas is used, and especially with ordinary burners, the latter method is obviously the better; and, in fact, there is much to be said in its favor for other reasons. The old adage of "cool head and warm feet" may be recalled, and certainly the air will be better diffused in this way.

Where the space per person is great, and there are no impurities excepting those from human beings, the fans, in winter, either partially or entirely draw their supply of air back again from the building, for the sake of economy from a warming aspect. As the air throughout the place is kept in constant motion, and not allowed to stagnate, it is found that it may be kept sufficiently pure by these means, as leakages are always going on through the roof, etc.

UNUSUAL CONDITIONS IN POTTERY WORKSHOPS

When we come to the pottery workshops difficulties immediately crop up with any of the foregoing methods. Considerable dust is created by the various processes undergone by the goods from start to finish, and this dust is much heavier than the air. The importance of this point may be clearly grasped by considering the action of a settling chamber filled with dust-laden air. If the air were quiescent, or nearly so, in a very short time it would be seen that the air was quite clear at the top of the chamber, and the dust would be noticeably dropping lower and lower until it found a resting place upon the floor of the chamber.

It is plain that a system which caused the air to be taken out from the top of the chamber would be wrong in principle and would not be likely to be as successful as one which drew the air from the bottom and so assisted the downward movement of the dust. Applying this principle to workshops in potteries the incoming air must, therefore, be introduced above the heads of the workers and exhausted at or near the floor level. Automatic means cannot do this, and so the fan remains as the means most calculated to secure efficient ventilation.

The extraction will have to be accomplished by mechanical means, for otherwise, with open doors, etc., the downward movement so desirable will be but partially effected. The floors in the workshops are covered with dust, particles of clay, etc. It is so from the very nature of the work carried on, and we do not see how it is possible for the creation of the dust to be avoided and the floor kept always clean. This being so, it may be that the movement to and fro of the workers about the room will cause a raising of dust which, if it rises to breathing level may be inimical to health.

In some workshops are drying chambers running along the centre of the rooms. These chambers being open to the room through frequent access openings. A very convenient way to adopt would be to exhaust by means of fans from the drying chamber, the doorways forming the outlets from the workshop. This should be fairly efficient, especially if cloth screens could be hung in the

openings without interfering unduly with ease of access. These screens would require to come down to within 12 in. to 18 in. of the floor. There is an advantage in utilizing the drying chamber for the air duct in that the drying would be improved and also the heated air of the drying chamber could not issue forth into the workshop.

DUST REMOVAL

We have said nothing, so far, about the local ventilation, as it is sometimes called, or, as we prefer to call it, dust removing. In the processes of towing, china scouring, ware cleaning, etc., dust is quite unavoidably created. We do not need to dwell upon the necessity for dealing with this dust at the point of generation. The points we most particularly should lay stress upon, are in connection with the positions of the extract openings. It must be remembered that the specific gravity of the dust is considerable, especially after dipping, and we should not ask it to come up to the outlet. Some plants working at present have their extract openings much too high, and frequently quite open without any hood. It is much better to have a hood, even if only comparatively small, for the air is guided and its effect more concentrated where required than if quite open. It is also more conducive to efficiency for the slots to be as near the point where the dust is created as possible, and, further, wherever practicable, the direction of the air through the slot should be at a downward angle or directly downward.

We are inclined to think that economy in power by reducing the quantity of air required could be secured in towing and some other processes by having hoods shaped somewhat similar to a crescent and tapering down to a comparatively narrow slot all round. Not having tried this we cannot express any definite opinion about it, but think it is worthy of trial.

The operaton of china biscuit placing is liable to cause a certain amount of very fine flint dust to be created, but this is easily removed by means of "long by narrow" hoppers fixed as near as possible to the workers' hands. Through the courtesy of a well-known firm we were afforded an opportunity of inspecting an installation they had recently fitted up, and they assured us that a noticeable improvement in the condition of the room was the result. They had a "flint-sifter" in the same room, also connected to the fan, and no doubt a part of the improved conditions could be traced to this. It would be conducive to economy and efficiency, where there was more than one worker in one room all engaged in this process, to bring them together and so shorten the ducts.

INCOMING AIR SHOULD NOT PASS OVER GAS JETS

There is one point to which we have previously alluded, namely, the use of gas for illumination. Where inlets are provided in the windows above towing benches, etc., it does seem as though the fresh air should not first have to meet the rising columns of warm products of combustion. It must lower the purity of the incoming air immediately it enters the workshop and, if possible, the workers should surely have the chance, so to speak, of receiving it as pure as possible. It would be better to conduct the fresh air to a point beyond the vertical plane of the gas jets and introduce it as low as possible, as explained previously. The more in number these inlets the less likelihood of draught and the better chance of efficient ventilation.

A Simple Rule for Figuring Air Supply

In the testing of ordinary ventilation the carbon dioxide is frequently estimated, not because it is a particularly harmful gas, but it is easy to estimate, and, being a fairly constant product of respiration, it is taken as an index of the air change; if there is an excess of this gas it is reasonable to suppose that there will be an excess of other

impurities providing that all the gas present is the product of respiration—it is on this basis that the standards of ventilation are at present fixed.

The amount of carbon dioxide in the outside air is about three volumes per 10,000. The inside standard aimed at depends on circumstances—it may be six or it may be twelve volumes. Whatever it is the amount of fresh air required to maintain that standard can easily be found by the following formula:

$$Q = 10{,}000 \frac{n\,c}{A - O}$$

n. Number of persons present.

c. Carbon dioxide in cubic feet given off from one person per hour.

A. Allowable limit of carbon dioxide in volumes per 10,000 in the building.

O. The amount of carbon dioxide in volumes per 10,000 outside.

Q. Quantity of air to be supplied per hour in cubic feet.

Supposing there are 50 people in a room, each giving off 0.8 cu. ft. of carbon dioxide per hour, and we fixed the allowable limit at eight volumes per 10,000, we should require 80,000 cu. ft. of fresh air per hour.—*J. Roger Preston.*

School Heating and Ventilation in Minnesota

By L. L. Hamilton

A description of the methods now in use for heating and ventilating school buildings in Minnesota, where intense cold is frequently experienced, is contained in a paper read by L. L. Hamilton, of the Roberts Heating and Ventilating Co. of Minneapolis, before the Minneapolis Architectural Club. Mr. Hamilton stated that the heating and ventilating of school buildings can be divided into seven general heads.

1. The district school—one room, without basement, using gravity system.

2. Schools—one, two, three and four rooms with basement, using gravity system.

3. Schools—using steam or hot water radiation with indirect or direct-indirect ventilation.

4. Schools—using direct radiation, with trunk line system of fan ventilation.

5. Schools—using furnace heat, with fan system of distribution.

6. Schools—using steam, with plenum or double duct fan system.

7. Schools—using furnace, with plenum or double duct fan system.

Each of the above systems is adaptable to humidifiers, heat control, and the mechanical systems with air washing devices, each commendable in its respective function and most desirable in connection therewith.

SYSTEM FOR DISTRICT SCHOOL

For the district school a special room furnace is used located directly in the school room (Fig. 1), which draws its supply of fresh air through a fresh air duct and discharges it at the top of casing through the annular space between the furnace and casing; causing the warm fresh air

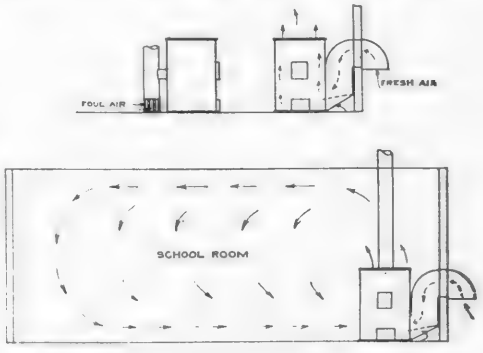


FIG. 1. FURNACE SYSTEM FOR DISTRICT SCHOOLS

to circulate within the school room and it has been found that the temperature in the extreme corner of the room will not vary 2° from the space within 6 or 7 feet of the heater itself.

The foul air is removed from the floor line by an opening either at the

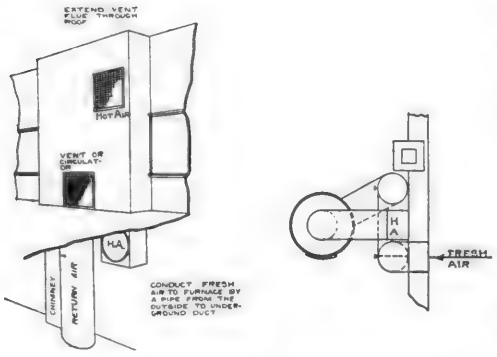


FIG. 2. FURNACE SYSTEM FOR SMALL SCHOOLS

base of the smoke flue or a special arrangement of the smoke pipe and the ascending smoke products acts as the motive force. This system, while not as elaborate or as scientific as the mechanical systems, when properly installed and used, greatly improves the conditions in district schools.

Another thing with the system installed, the school room can be heated much more quickly than with stoves and also more cheaply and can be explained as follows:

The circulation caused by the jacketed furnace distributes the heat more readily and, in addition to this, produces a uniform heat throughout the room, while with the heat from a stove the tendency it has to overheat one portion of the room and neglect the other and at all times the temperature of the upper portion of the room is very much overheated if an attempt is made to keep the floor at all comfortable.

SYSTEM FOR SMALL SCHOOLS

With small schools with basements, the simplest and best system is the furnace when properly installed—that is, due attention should be given to the size of the ducts and to see that the openings are located in a scientific and sanitary manner. Fig. 2 shows a model arrangement in this particular and it will be noticed that the unsanitary floor registers have been dispensed with, and means provided for the introduction of fresh air as well as recirculating the air within the building when not occupied—thereby saving fuel. This same arrangement can be modified, for two rooms, and the four-room propositions would ordinarily be handled with two furnaces.

DIRECT RADIATION SYSTEM

Fig. 3 represents a school room with direct radiation—these radiators are supplied with what is known as a "box base" having an outside connection with fresh air, and are known to the trade as direct-indirects. This base is arranged with shutters so that the outside air may be drawn up through the radiators or the air can be recirculated within the room. This system is susceptible of good work, but at the present time the "box bases" as manufactured are entirely too small and the free area through the radiation inadequate to get good results.

With the straight indirect system the indirect-radiators are placed in a galvanized iron duct and the outside air is forced to pass over them before entering the room. The foul air is discharged into a duct with the opening at the floor level, and this is usually provided with an aspirating coil placed either immediately over this opening or in the attic. The former method, however, is preferable.

The foregoing methods are all

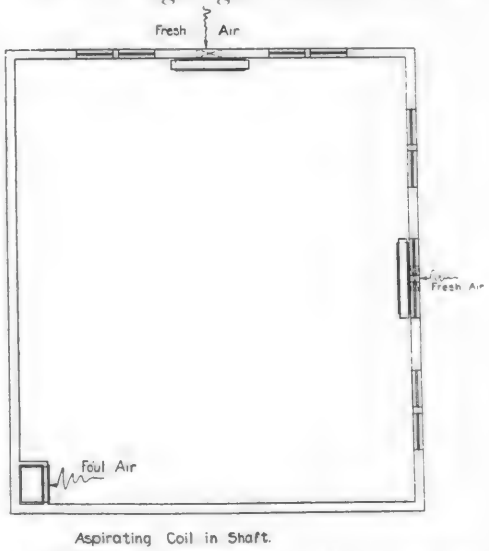


FIG. 3. WITH DIRECT-INDIRECT SYSTEMS. THE "BOX BASES" ARE USUALLY TOO SMALL

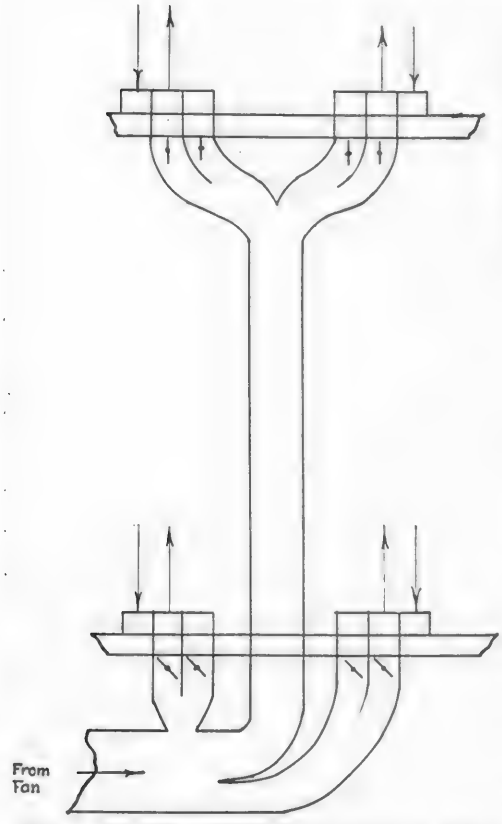


FIG. 4. TRUNK LINE FAN SYSTEM OF VENTILATION USED WITH DIRECT RADIATION

gravity propositions, still they are commendable and should be encouraged.

COMBINATION SYSTEMS MUCH USED

Schools having direct-radiation, with a trunk line fan system of ventilation (Fig. 4), represent a typical installation of the better class of school building in the Northwest, and is the system installed in most of the Minneapolis schools; the action is positive in its results and perfect ventilation is secured regardless of atmospheric conditions.

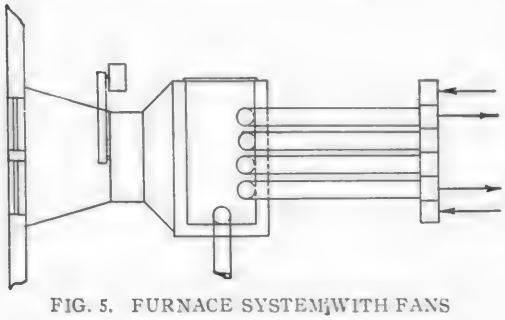


FIG. 5. FURNACE SYSTEM WITH FANS

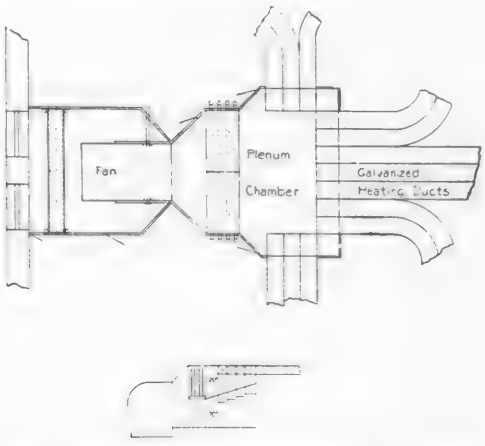


FIG. 6. DOUBLE DUCT OR PLENUM SYSTEM

Furnace heat with fan system of distribution (Fig. 5) represents the most maligned system installed in school building from the fact that it is too often put in by incompetent workmen, and the poorly constructed furnaces used have helped to give the system a bad name—yet the principles of this form of heating are correct when installed in a scientific manner and we can predict a great future for it in small buildings, say four to eight rooms; in addition to

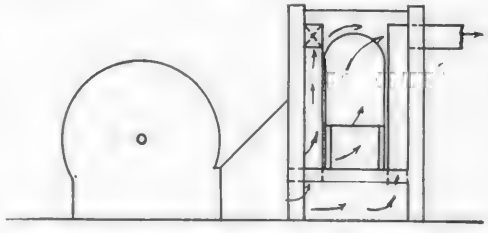


FIG. 7. ANOTHER ARRANGEMENT OF DOUBLE DUCT OR PLENUM SYSTEM

the other good features it especially adapts itself to the poor janitor service and to the pocket books of a community that cannot afford the higher priced steam systems.

THE PLENUM SYSTEMS

Figs. 6 and 7 represent the highest type of heaters for school work, the double duct or plenum systems. With these systems not only a positive degree of heat is maintained, but a constant volume of air is supplied at all times. The mixing dampers are usually controlled by heat regulators, allowing the proper pro-

portion of tempered and reheated air to enter the room to maintain the temperature desired; the valves, of course, being actuated from a thermostat placed in each room. With the fan systems there is always a slight pressure within the building and any leaks around the doors and windows are outward, preventing draughts, cold floors, and variable temperatures. In extra large installations sometimes we use the combined plenum and exhaust systems, in which case the exhaust fan is always of a smaller capacity than the supply fan.

Methods of Providing for Expansion in Steam Piping

A review of the present practice in caring for expansion in steam piping was contained in the following discussion of the subject, contributed to the Transactions of the American Society of Civil Engineers by Ralph C. Taggart:

In steam piping, expansion is cared for by two general methods: First, by the use of so-called expansion joints; and second, by the arrangement of the piping, so that the expansion is cared for by the spring of the piping itself.

In apparatus where the straight runs of pipe have not been too long, the second method has been used almost exclusively, although the allowance for expansion has usually been one of judgment or guesswork, and not a matter of calculation.

EXPANSION JOINTS

Where the expansion has been considerable at any one place, it has been common practice for the designing engineer to resort to the use of so-called expansion joints.

One of the best-known types is made with one metal cylinder sliding or slipping within another. There is, ordinarily, a packed gland or stuffing-box to prevent leakage. An expansion joint of this type should always be anchored, and the pipe which moves within it should also be anchored at a point some distance from it—the distance being determined by the amount of expansion which this particular joint should care for.

If the pipe and expansion joint are not thus anchored, the movement of the pipe and the thrust of the steam pressure may carry the inner cylinder of the expansion joint entirely away from the outer cylinder in which it moves. This type requires more or less packing, and although this may not be an important item if only a few expansion joints are used, and if they can be gotten at readily, nevertheless it becomes very important where an engineer has to look after a number of these joints, or where they cannot be reached with the greatest ease.

In the second type of expansion joint, a circular metal disk is fixed at its outer circumference and attached to the expanding pipe near its center. The expansion is taken care of by the spring in the metal disk, and, for this reason, the amount is usually quite small.

A third type of expansion joint is made up of what may be described as a copper pipe with deep corrugations, reinforced with steel rings. Under certain conditions this joint has been very unsatisfactory. Where it has been subjected to varying temperatures, as, for example, in a heating apparatus where the steam pressure is more or less intermittent, the movement in the copper has resulted in breaking at the corrugations. It is claimed, however, that some good results have been obtained where the steam pressure was not very high, and where the pressure and temperature have been very constant.

TWISTING OF PIPE WITHIN FITTING NOT SATISFACTORY

Some authorities have suggested the use of fittings arranged so that the expansion will be cared for by the twisting of the pipe within the thread of the fitting. This has been done in some cases in low-pressure work, but a little thought or experience will convince one that it is not a method to be relied on, for as soon as the slightest actual twist occurs within the fitting, the pipe becomes loose, and the joint formed by any white lead or varnish is broken. This destroys the effect of the white lead or varnish, and the difficulty of making an ordinary pipe joint tight without some such cement is well known.

In many cases, where it is thought that the expansion is cared for by a twisting in a fitting, a careful examination will show that it is really cared for entirely by the spring of the pipe, and it may be set down as a safe rule that, if there is actually a twist in the pipe-thread, due to expansion, there will almost surely be a leak, even where the pressures are low.

WATER-PACKING

It may be interesting, here, to mention what is known as water packing. A so-called steam-tight joint is sometimes made where one piece of metal slips within another, a few circular rings or grooves being cut in one of the cylinders. The fit, of course, must be very good, and the idea is that the condensed steam in the rings or grooves forms a sort of packing. This arrangement is used with engine indicators and with some reducing-pressure valves of the piston type, where a steam-tight joint is desired and where one cylinder must slip within the other.

The success of the joint depends on two things: First, and principally, on very accurate workmanship; and second, on the fact that if a very little steam passes through the joint, any part of it which is condensed will evaporate immediately and pass away unnoticed. This is very soon proven, if the discharge from a reducing-pressure valve of this type is closed, and the line leading to it fills with water, when it will be seen that water is leaking from the joint. This is one reason for the old saying that it is easier to make a joint steam-tight than water-tight.

PIPE BENDS

The most common way in which expansion is cared for in steam piping is by the spring or bending of the pipes, where a change in direction occurs, and, on the whole, this method is the most satisfactory. The allowance to be made for expansion, or the length of the spring pieces, however, is usually guessed at, or is determined by experience, rather than by accurate calculation.

The method of using several small pipes or bends in place of one large pipe or bend has been suggested, and can sometimes be used to advantage. The intention is, of course, to make this section of piping capable of greater bending, and, at the same time, not to reduce the area through which the steam or fluid passes. The combined cross-sectional area of the small pipes may be made equal or larger than that of the large pipe, while the bending will be equal to that of one small pipe.

USE OF COLD STRAIN

There is one point in connection with the expansion of pipes, to which particular attention is called. It is possible to reduce greatly the effects of expansion by the use of what is called a cold strain. William J. Baldwin, M. Am. Soc. C. E., was the first, the writer believes, to make use of cold strain in order to reduce the necessary allowance for expansion, and he has gone as far as to put the entire strain in the cold pipe in some cases.

By cold strain is meant the cutting of the pipe in such a manner that the pipe will be strained when cold in exactly the opposite way from that in which it is strained by expansion when hot. If the cold strain is 50% of the normal expansion, the pipe will be strained 50%

in what may be called a negative direction when cold, and 50% in the opposite or positive direction when hot. By this means it is possible to reduce the strain in the pipe to half the normal strain of expansion, and thus reduce the necessary allowance for the same in this proportion.

There are advantages, however, in making the cold strain greater than 50%. If, for instance, the cold strain is exactly equal to the expansion, then the pipe is under strain when cold and entirely free from strain when hot or, in other words, the tendency to strain open one side of a pipe flange is a maximum when the pipe is cold or when there is no pressure on it, and it becomes zero when the pipe is hot or when there is a maximum pressure on it. The strain of expansion is also eliminated when that due to steam pressure is a maximum, so that the pipe is not subjected to the two strains at the same time.

If the cold strain is something less than the full expansion, these effects are, of course, proportionately decreased.

Perhaps it might be of interest to mention one instance in which the advantage of cold strain was used to remedy what seemed to be a serious trouble. A leak in one of the main steam pipes in a large hotel was causing much annoyance. The cause of the trouble was simply that the flanges were thrown out of line by the strain of the expansion of the piping. The location was such that it was of the utmost importance not to shut off the steam from this pipe for more than a very short time. Various expedients had been suggested, all requiring a shut-down of the plant for a considerable length of time, when it was suggested by Mr. Baldwin, that one length of flanged pipe be replaced by a similar piece of pipe, cut enough shorter, however, to eliminate entirely the excessive strain of expansion when the piping was hot. This new piece of pipe was made ready before the plant was shut down, and the time, therefore, during which it was not in operation, was limited to a very few minutes.

There is another advantage due to cold strain, which may be mentioned, and which will be appreciated particularly by the steamfitter or the man in charge of the erection of the work, wherever flanged piping is used. The advantage is simply this, that a flange joint when unbolted will tend to open up and allow an easy removal of a gasket.

Precautions to Be Taken in Measuring Air Velocities

The usual instrument for measuring the velocity of air currents is an arrangement of small vanes and gearing which is called an anemometer. Now this instrument is very handy *if properly used;* at the same time, if proper precautious are not taken, the reading may be easily 100% out.

It must be noted that these instruments do not as a rule give the correct direct reading; but the readings have to be corrected by means of a chart supplied by the makers, and which is supposed to be plotted out from actual tests of that particular instrument. With the above type there is always the inconvenience of having to time it with a watch. This is often very awkward. To overcome this defect what is called a self-timing anemometer was introduced, and has lately been much improved and made quite reliable; all that is necessary is to hold the instrument face towards the current for a second or two, then, when the vanes are well on the swing, press the knobs at the top and the finger at once shows you the velocity of the air in feet per second. To ensure accuracy each dial is calibrated separately. We must say we

find the instrument most useful in practice.

Another important point to watch is not to use an instrument designed for low velocities for very high ones. There is no doubt this is done very often to the detriment of the anemometer and the results of the observer. Specially constructed ones for high velocities are obtainable.

Assuming we pay attention to the above points, and have an instrument suitable for the work in hand, there are still many precautions to be taken. In nearly any duct or opening the velocity varies a very great deal at different points on the cross section, especially if there are any bends near the opening.

It is obvious, therefore, to overcome this we must take a mean of these velocities. Now there are two ways of doing this, one is to split the opening up into square and ascertain the velocity of each, and take a mean; the other, to split the area up with wires running parallel and about 6 in. apart. The anemometer is slowly carried between these wires till it has covered the entire surface.

The first way is no doubt, theoretically, most exact; but experience teaches that the second way is practically as accurate for many cases, if care is taken, and much more convenient. Another common mistake is to attempt to estimate the amount of air passing through a comparatively small hole with an anemometer larger than the opening. Of course this is permissible providing the correct curve is known for exactly that size and shape of opening, which in practice is rarely obtainable.—*J. Roger Preston.*

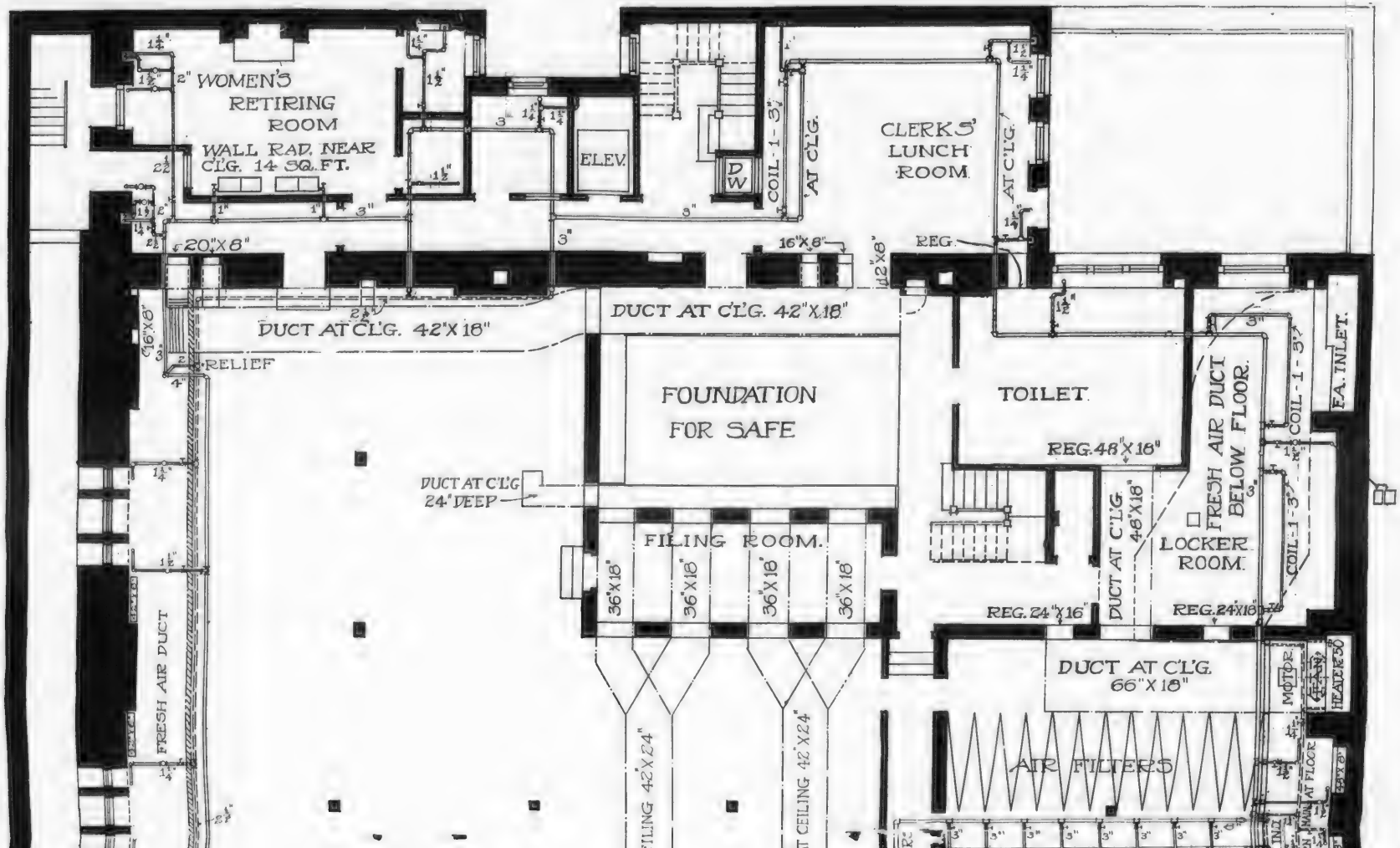
Heating and Ventilation of the Union Dime Savings Bank, New York

A Notable Application of the Combination System

The new Union Dime Savings Bank building, at Sixth avenue and Fortieth street, New York, is a typical up-to-date commercial building, representing in its mechanical equipment many features of the most ap-

UNION DIME SAVINGS BANK, NEW YORK

PLAN OF BASEMENT, UNION DIME SAVINGS BANK, NEW YORK, SHO



SHOWING ARRANGEMENT OF HEATING AND VENTILATING SYSTEM

proved present day engineering practice. It is a three-story and basement structure of steel frame construction. The base of the exterior is of polished pink granite and the rest of the exterior is of dark blue Indiana limestone. The roof is made of green slate and copper.

The building occupies a site 110 ft. x 99 ft. The interior is of imposing proportions, with a banking room 48 ft. high and measuring 96 ft. x 86 ft., without a column or obstruction of any kind. This apartment is lighted through a huge dome of leaded glass.

One of the special features of this installation is that the warm air ducts consist throughout almost their entire length of a passage a little more than 6 ft. in height, partitioned off by a wire lath and plaster construction and located next to the outside wall of the building. The light from the basement windows reaches the basement proper by passing over the top of this passage or duct.

The air for the ventilating system is taken from a point near the roof and is brought into the space in front of the air filters. Thence it passes

MAIN BANKING ROOM, UNION DIME SAVINGS BANK

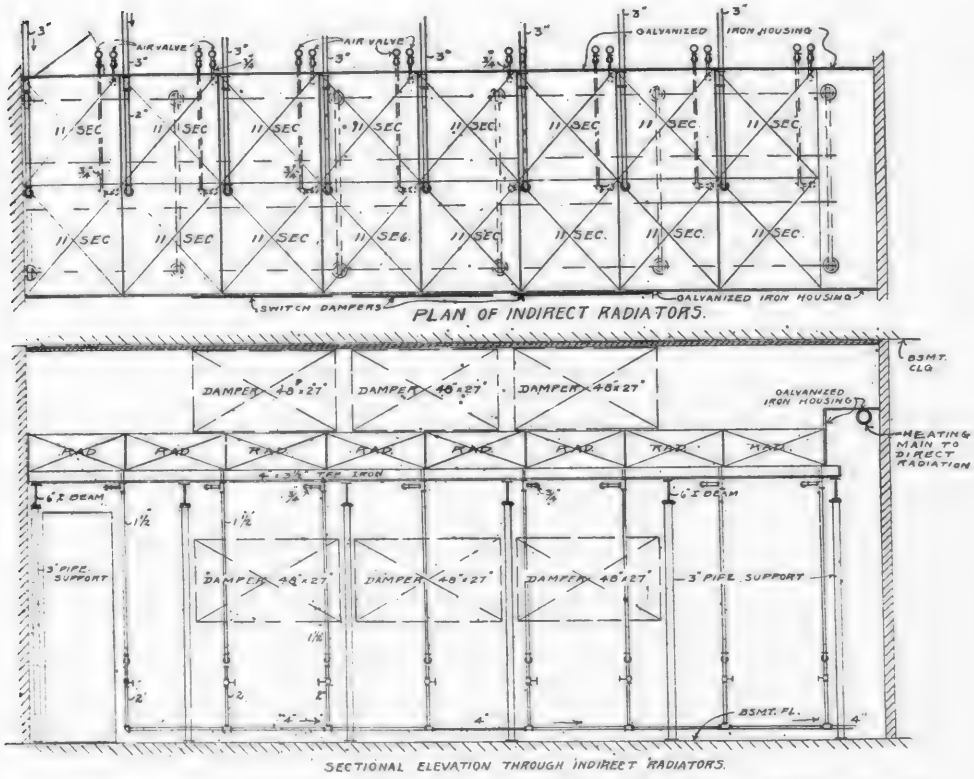
The westerly part of the building is sub-divided into three floors. At the banking floor level are the president's room and the committee's rooms; on the second floor the directors' room and a luncheon room; and on the third floor, the janitor's apartments.

The building is warmed by steam from two low-pressure cast-iron boilers. A system of direct radiation is supplied by independent steam piping from the boiler room and there is also a group of indirect heaters which are used to warm the air for ventilating the building.

through special milk straining copper wire gauge in the air filters. These filters, it should be noted are arranged so that they may be cleaned by means of a vacuum cleaning system.

After passing through the air filters the air is warmed by the indirect heaters which are provided with double dampers controlled by graduated action thermostats. The apparatus is designated to warm this air to about 70°. It is then forced by a 96-in. fan into the tempered air ducts.

The connections to the warm air registers consist of vertical pipes



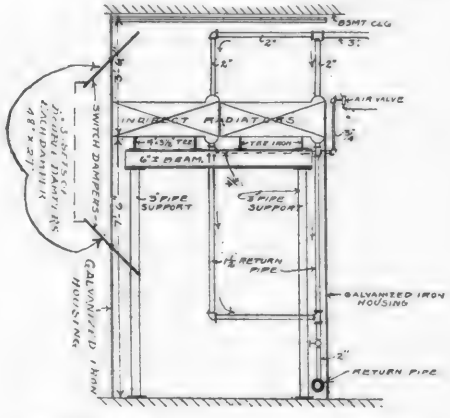
ARRANGEMENT OF INDIRECT HEATING APPARATUS, UNION DIME SAVINGS BANK

leading from the duct to the registers, so that any dust within these flues will drop into the large air passage-way, which can be readily swept out. Where the duct is carried above door-ways it has been made large enough so that a man can readily pass through it.

Another special feature in connection with this duct or passage-way is the fact that the velocities of the air through the duct have been kept so low that when the fan motor is doing about 2 H. P. of work, the quantity of air furnished is 1,000,000 cu. ft. per hour.

In the main banking room and in certain of the other rooms, the direct radiation stands behind screens or grills. These are arranged so that they can be easily opened and the space around the radiators cleaned out. In addition, all the valves controlling these screened radiators have been placed at the basement ceiling. In the case of the radiators in the main banking room, which are arranged on the two-pipe system, the air valves have also been placed in the basement.

An 84-in. vent fan is arranged to draw air in the winter time through floor grills which are located in front of the main vault. The air is drawn through the grills into a passage-way in front of the vault foundation whence it passes through ducts to the vent fan. If any papers should pass through this grill they would lodge



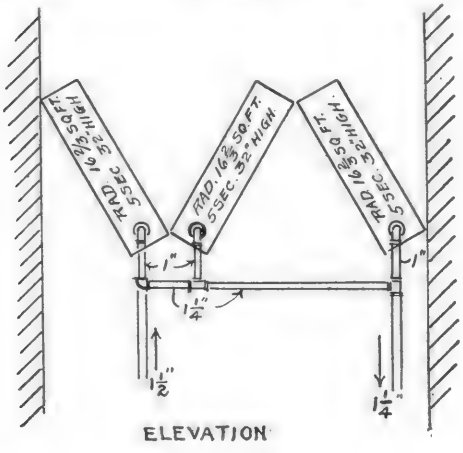
SECTIONAL ELEVATION THROUGH INDIRECT RADIATORS

in the passage-way in the basement and would not be drawn into the vent ducts, as the opening to these ducts is closed by a screen.

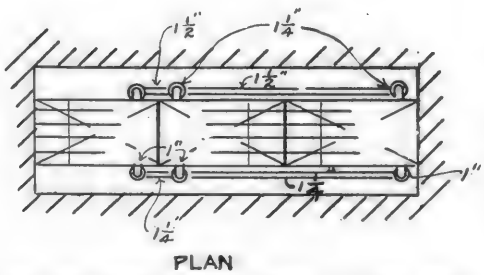
Although the vent ducts are located near the ceiling, they are made of such size that they can be readily cleaned out and the connections at the 84-in. fan are so arranged that it is possible in the summer time, if desired, to blow air into the bank by means of this fan, instead of using the fan to exhaust the air. In case the engineer, however, should attempt to blow air into the bank through the vent ducts in the winter time, the drop in the temperature of the air will actuate a thermostatically-controlled damper, so that it is impossible for cold air to be blown into the bank by this fan in the winter time.

A separate small fan is arranged to ventilate the basement toilet rooms and several of the other basement rooms.

Special outlets of large area are placed in the ceiling of the banking room. These are for use in the summer time to provide an outlet for the warmest air in the bank.

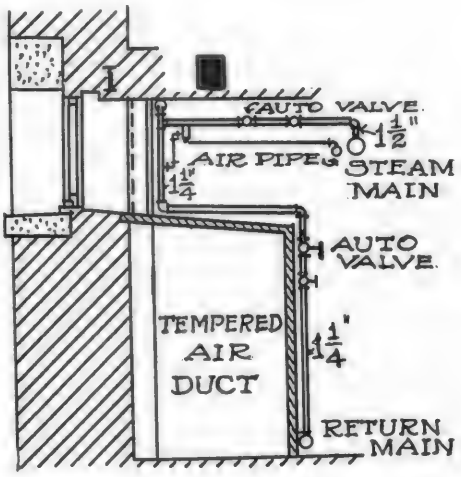


ELEVATION



PLAN

ARRANGEMENT OF HEATERS IN TWO VENTILATING SHAFTS, EACH 24 IN. x 72 IN.



ELEVATION SHOWING ARRANGEMENT OF RADIATOR CONNECTION ABOVE AIR DUCT

In a few cases in which piping is run in the tempered air duct in the basement, the pipe is first covered with pipe covering and this is encased in galvanized iron so that no dust or dirt will adhere to it.

The architect of the building is Alfred H. Taylor, New York. The heating and ventilating system was laid out by William J. Baldwin and Ralph C. Taggart, New York, and the plant was installed by Gillis & Geoghegan, New York.

The Movement of Air With Natural Ventilation

In all ventilation there must be a circuit of air, just as much as there must be a circuit of electricity in electrical work. It is no use having an expensive extract on the roof if there are no inlets to allow the fresh air to enter the room; how simple and how obvious is this fact, and yet how often disregarded.

Assuming that the air is quite still outside, its movement in the building will be caused entirely by the difference of the outside and inside temperatures: the greater the difference, the greater the movement. The velocity can be found by the following formula, which must be used with judgment, al-

though a reasonable allowance is made for friction:

$$V. = 4\sqrt{\frac{h(t'-t)}{t+460}}$$

V. = Velocity in feet per second.
h. = Height of flue in feet.
t′ = Inside temperature of flue.
t. = External temperature.

As the V is proportional to the square root of the temperature difference t′ — t, also to the square root of h, it will be seen that even for a very moderate building there must either be a great difference in temperature between the external air and the air in the flue—a very high flue—or one of large area.

Whatever may be the amount of air going up an extraction shaft, or coming in at the inlets, there is always an independent circulation going on in the room itself due to convection currents.

You will nearly always find the air descending against a window, unless some special means have been taken to prevent it, or the outside temperature is high; the reason is that the glass is rapidly conducting the heat from the air in contact with it, and thereby causing it to fall.—*J. Roger Preston.*

Utilizing Producer Gas for Heating

The application of producer gas to power plants is of such widespread interest that the United States Geological Survey has devoted several years to the investigation of the values of various kinds of coal as gas producer fuels. The results of this work appear in Bulletin No. 416. In a series of ten tests conducted at Norfolk, Va., the average amount of coal per brake horse power per hour was 0.92 pound, and varied from 0.80 to 0.98.

These figures may very properly be compared with others published in the same bulletin: Mr. Stott, superintendent of motive power of the Interborough Rapid Transit Co., New York City, is therein quoted as saying that but 10.3% of the energy in fuel is utilized as electrical energy in the Interborough power house. He also presents in his paper before the American Institute of Electrical Engineers, 1906, a table showing the thermal efficiency of producer gas plants, concerning which he says: "The following heat balance is believed to represent the best results obtained in Europe and the United States in the formation and utilization of producer gas:" and in this table shows that 24% of the energy of the coal is converted into electrical energy. Mr. Stott's figures seem to show that 24% for the best producer gas plants should be compared with 10.3% for large steam plants.

In the tests conducted at St. Louis by the Government on smaller apparatus and apparatus of the ordinary type, the amount of heat converted into electrical energy is much smaller, being only 4.86% for steam power and 13.5%, or nearly three times as much, for gas power. The evidence seems to be so overwhelmingly in favor of producer gas as a power plant fuel that the question naturally arises as to why it is not more generally used. The difficulty encountered in the elimination of tar from producer gas made from bituminous coal, has first of all been a serious handicap for a large part of the country.

Another difficulty is the heating of factories. Practically all factories are steam heated, a condition which results from or leads to the use of steam for power also. Doubtless large numbers of small industries would use gas producers were it not for the heating problem.

One instance of the solution of this problem was described in our January issue, showing the use of producer gas in a Harrison "aertube" heater, in which the heat from the gas is transferred direct to the air which is forced through the tubes by means of a fan and is then distributed to the various parts of the building by means of ducts and flues.

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Back numbers, - - - - - - 15 cents a copy

WHILE the provisions of the New York State factory ventilation law have been enforced with decided effect and have resulted in the improvement of conditions in hundreds of manufacturing lofts, especially in New York, the growing determined opposition to the law in its present shape being shown by factory owners and landlords, who are members of the Realty League of New York, constitutes one of the strongest arguments in favor of adopting a standard form of bill on this subject before pressing its passage before a state legislature. The New York landlords, for instance, have gone on record as endorsing the spirit of the present law, yet they present a strong case when they state that "an insuperable objection to complying with a vague, unsatisfactory and uncertain law exists in the fact that the statute fails to confer upon the Department of Labor the authority to determine what is proper and sufficient ventilation. In the absence of such proper statutory authority the large expenditure of money necessary to be made to satisfy one commissioner would be thus wholly thrown away if not deemed sufficient by his successor. The league is willing to coöperate with the department to bring about such legislation as may protect an owner so that when he has done what the law may require of him the law will protect him against demands for further changes."

As is generally known, a revision of the present factory ventilation law is being prepared and is likely to be passed at the present session of the New York State Legislature.

THE ESTABLISHMENT of open-air schools for children, which is being conducted on a large scale in some cities, is heralded by many lay sanitarians as a solution of the ventilation problem. Seriously, however, as a criticism of the present state of the heating and ventilating art, it is one of the "most unkindest cuts" the ventilating engineer has had to bear. Observe the straits to which the modern sanitarian is reduced:

"The windows about the sides lift, so that there is an open zone around the tent. In fair weather the children take their rest hour in the open. Meals are served in the dining-room, two floors below, and the daily bath is taken in bathrooms in the building proper.

"The Eskimo suits have not been used in any similar school. During their rest period the children are also wrapped in blankets, but restless children often displace the blankets and become more or less exposed, while the warm, loose-fitting suits stay in place. Moccasins similar to those used by lumbermen are worn."

MECHANICAL EQUIPMENT

Analysis of a Power Plant for a Modern Building

The variety of services rendered by the mechanical equipment of a modern building is strikingly illustrated in the accompanying diagram reproduced from the forms of a new course at Columbia University, known as Plant Management, and conducted by J. C. Jurgenson, formerly chief engineer of the Hotel St. Regis, New York, and now chief engineer of the Abraham & Strauss department store in Brooklyn.

While the diagram is a comprehensive one, covering apparatus that would not often be found in one building, still it is seldom that any of the more important features are omitted, especially where the plant is an isolated one. It illustrates to a marked degree the increased knowledge made necessary on the part of the heating and ventilating engineer by the steady development in the mechanical equipment of buildings.

It will be of interest to state that

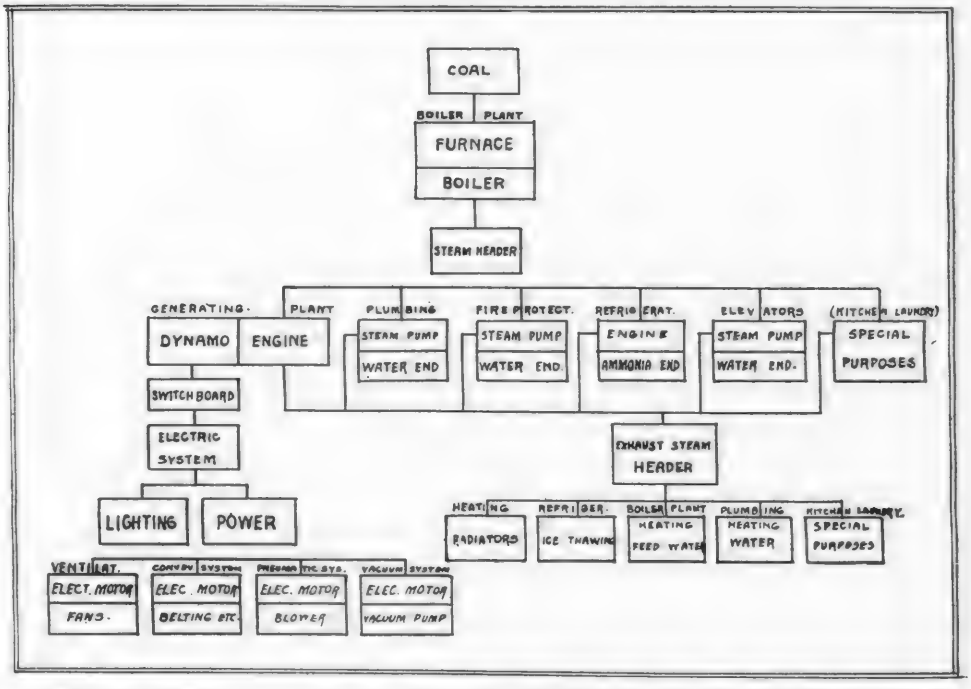
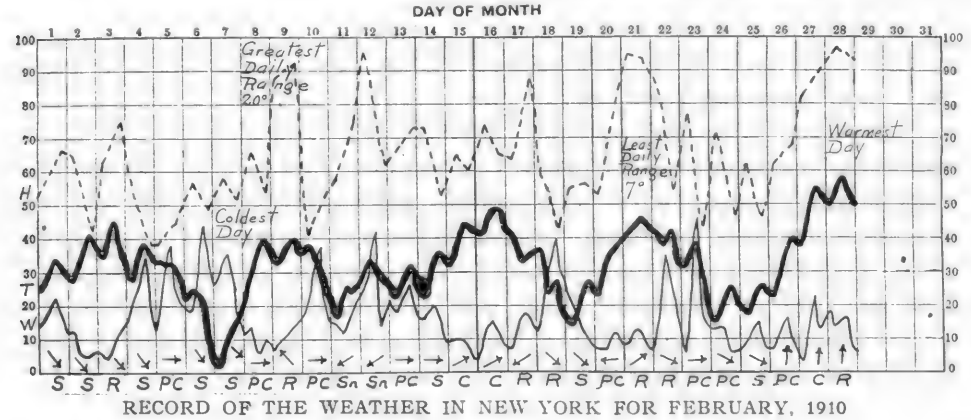


DIAGRAM SHOWING ANALYSIS OF SERVICES RENDERED BY THE POWER PLANT OF A MODERN BUILDING

THE HEATING AND VENTILATING MAGAZINE will, in due course, present in this department special articles on practically each of the various uses for steam power indicated in the accompanying chart, in addition to those in connection with the heating and ventilating systems.

The Weather for February, 1910

	New York	Boston	Pittsburg	Chicago	St. Louis
Highest temperature, deg. F.	59	60	55	51	65
Date of highest temperature	28	16	27	15	15
Lowest temperature, deg. F.	2	−3	2	−6	1
Date of lowest temperature	7	6–7	7	23	23
Greatest daily range, deg. F.	20	31	29	26	35
Date of greatest daily range	8	8	20	22	15
Least daily range, deg. F	7	6	6	6	6
Date of least daily range	21	4	22	10	3
Mean temp. for month, deg. F.	31	29	29	25	29
Normal mean temp. for this month	30.7	28	32	25	34
Total rainfall, inches	4.07	3.44	3.60	0.89	3.22
Total snowfall, inches	5.3	12.6	16.2	2.8	21.3
Normal precipitation, this month	3.80	3.42	2.73	2.16	2.83
Total wind movement, miles	9679	8710	7862	10864	8462
Average hourly wind velocity, miles	14.4	13	11.7	16.2	12.6
Prevailing direction of wind	West	West	N. W.	S. W.	South
Number of clear days	8	11	6	6	10
Number of partly cloudy days	10	5	9	9	7
Number of cloudy days	10	12	13	13	11
Number of days on which rain fell	7	6	5	3	5
Number of days on which snow fell	2	5	8	6	10
Snow on ground at end of month, inches	None	None	Trace.	0.4	Trace.


DAY OF MONTH
Greatest Daily Range 20°
Least Daily Range 7°
Coldest Day
Warmest Day
H
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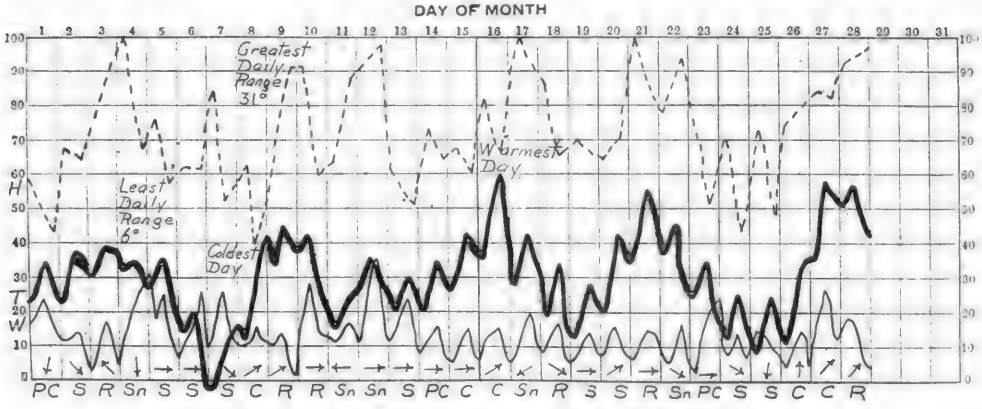
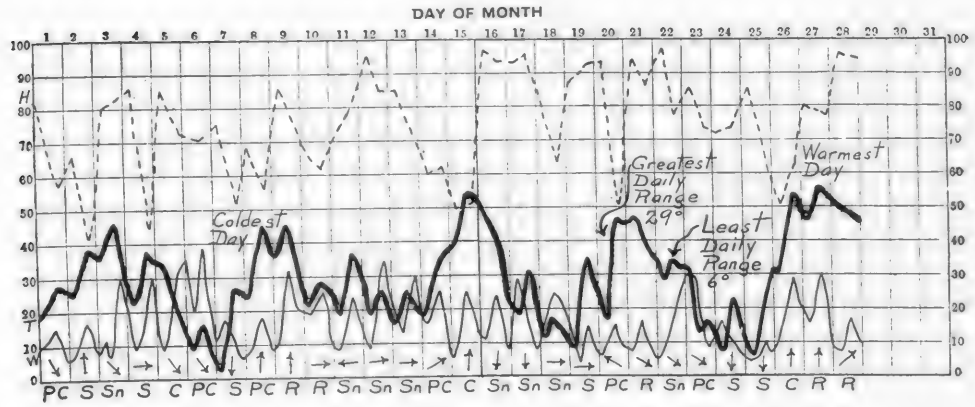
W
S S R S PC S S PC R PC Sn Sn PC S C C R R S PC R R PC PC S PC C R

RECORD OF THE WEATHER IN NEW YORK FOR FEBRUARY, 1910

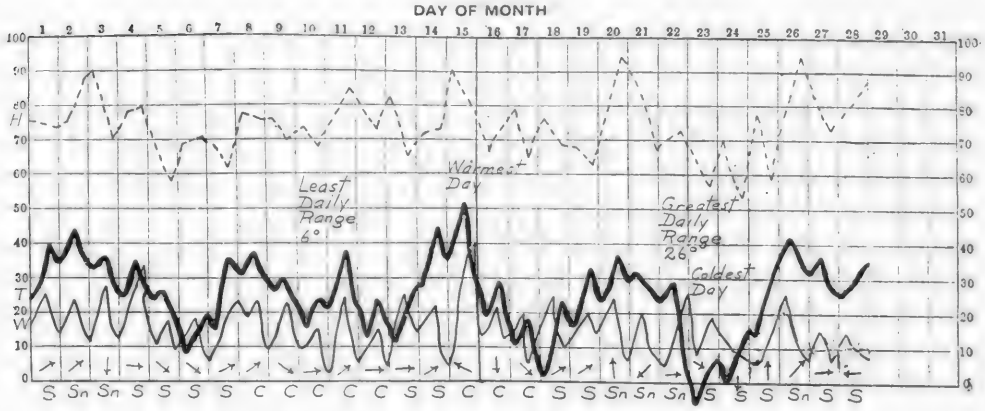

DAY OF MONTH
Greatest Daily Range 31°
Least Daily Range 6°
Coldest Day
Warmest Day
H
T
W
PC S R Sn S S S C R R Sn Sn S PC C C Sn R S S R Sn PC S S C C R

RECORD OF THE WEATHER IN BOSTON FOR FEBRUARY, 1910

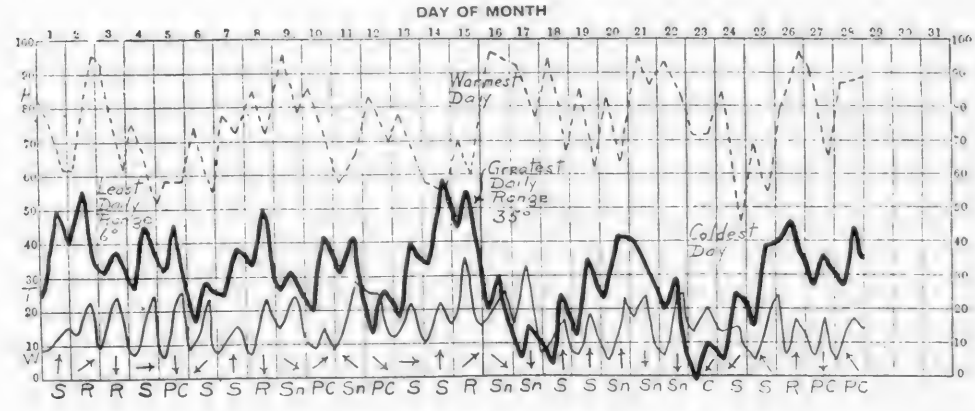
Plotted from records especially compiled for THE HEATING AND VENTILATING MAGAZINE by the United States Weather Bureau.
Heavy lines indicate temperature in degrees F.
Light lines indicate wind in miles per hour.
Broken lines indicate relative humidity in percentage.
S—clear, P C— partly cloudy, C—cloudy, R—rain, Sn—snow.
Arrows fly with prevailing direction of wind.



RECORD OF THE WEATHER IN PITTSBURG FOR FEBRUARY, 1910



RECORD OF THE WEATHER IN CHICAGO FOR FEBRUARY, 1910



RECORD OF THE WEATHER IN ST. LOUIS FOR FEBRUARY, 1910

Plotted from records especially compiled for THE HEATING AND VENTILATING MAGAZINE by the United States Weather Bureau.
Heavy lines indicate temperature in degrees F.
Light lines indicate wind in miles per hour.
Broken lines indicate relative humidity in percentage.
S.—clear, P C—partly cloudy, C—cloudy, R—rain, Sn—snow.
Arrows fly with prevailing direction of wi d

Current Heating and Ventilating Literature

Under this heading is published each month an index of the important articles on the subject of heating and ventilation that have appeared in the columns of our contemporaries. Copies of any of the journals containing the articles mentioned may be obtained from THE HEATING AND VENTILATING MAGAZINE *on receipt of the stated price.*

SHOP HEATING

Heating a Shop Through Its Floors. Illustrated detailed description of a novel system in the plant of the Morse Chain Co., Ithaca, N. Y. 3000 w. Am Mach, Vol. 33, No. 6. 20c.

Heating and Ventilating Offices in Shops and Factories. Charles L. Hubbard. Describes several methods more or less efficient according to cost. Ills. 2500 w. Mach, N Y—Feb., 1910. 40c.

Minnesota's Heating and Ventilating Regulations for School Buildings

The requirements of the Minnesota State Board of Health, relating to the construction, etc. of school buildings are as follows:

146. No school room or class room, except an assembly room, shall have a seating capacity that will provide less than 18 sq. ft. of floor space and 216 cu. ft. of air space per pupil, and no ceiling in buildings hereafter to be erected shall be less than 12 ft. from the floor.

147. A system of ventilation, in order in order to be approved by the Minnesota State Board of Health, shall furnish not less than 30 cu. ft. of air per minute for each person that the room will accommodate when the difference of the temperature between the outside air and the air in the school room shall be 30° F. or more.

148. In a gravity system of ventilation in connection with a furnace or steam plant the flues for admitting fresh air to the room, as well as the vent flues, shall have a horizontal area of not less than 1 sq. ft. for every nine persons that the room will accommodate.

149. The flues for a plenum or vacuum system of ventilation shall have a horizontal area of not less than 1 sq. ft. for every fifteen persons that the room will accommodate.

150. The window space shall equal one-fifth of the floor space of the school room.

151. In all rooms not exceeding 25 ft. in width all the light shall be admitted to the left of the pupils.

152. In rooms exceeding 25 ft. in width, light shall be admitted to the left and rear of the pupils.

153. Translucent instead of opaque shades shall be used in the windows for controlling the light.

154. The top of the windows shall be as near the ceiling as the mechanical construction of the building will allow.

155. No cloak room shall be less than 6 ft. wide, nor shall it have less than one window.

156. The so-called "sanitary wardrobe," which allows the foul air of the room to pass through the clothing of the children before passing into the vent duct, shall be condemned as unsanitary.

James Henry Blessing

1837-1910

James Henry Blessing, whose death February 21, 1910, was noted in our last issue, belonged to that remarkable group of pioneers in the steam heating industry who blazed the way for many of the most important developments in the art. His name will always be associated with the Albany steam trap, of which he was the inventor, but this was only one of 120 inventions he perfected of steam operated devices. To him, for instance, belongs the credit for the origination of the steam loop which has long been widely used and which was really the forerunner of the return steam trap.

For 50 years Mr. Blessing has been engaged in business in Albany, N. Y. He was elected mayor of Albany in 1899 and would undoubtedly have been re-elected had not the state of his health compelled him to relinquish the office.

He was born at French's Mills, near Sloan's, in Albany county, in 1873. When he was about five years of age his parents moved to Albany. He attended the public schools until he was 12 years old, when he secured a position as a clerk in a grocery store. In 1853 he was apprenticed to learn the machinist trade with the then well-known firm of F. & T. Townsend. His apprenticeship was completed in 1857, and he remained with that firm until 1861. During that time he, with the late Frederick Townsend, invented a breech-loading rifle intended for army use.

When the Civil War broke out, Mr. Blessing entered the United States navy as an acting assistant engineer. He participated in both battles at Fort Fisher. After the war and until 1866, he was an engineer in charge of the steam machinery of the Brooklyn City Railroad company. He returned to Albany in 1866 to act as superintendent for Townsend & Jackson's foundry and machine works, successors to the firm with which he served his apprenticeship.

In 1870 Mr. Blessing invented the return steam trap, which has become well known, and is used generally in nearly all parts of the globe. Leaving the employ of Townsend & Jackson in 1872, he, with General Frederick Townsend, engaged in the business of manufacturing and selling steam traps, under the firm

name of Townsend & Blessing. This business proved successful, and in 1875 the Albany Steam Trap company was formed with three stockholders, the late General Frederick Townsend, the late Henry H. Martin and Mr. Blessing.

Mr. Blessing's mechanical training had developed many novel and useful inventions, among them steam engines, steam traps, steam pumps, steam boilers, steam valves, steam packing, pump governors, steam and oil separators, friction clutches, water filters, boiler purifiers and many others.

Mr. Blessing was a member of the American Society of Mechanical Engineers, also of the Albany Institute. He had held but one public office before being elected mayor, that of supervisor of the fifth ward in 1894. At that time the fifth ward was strongly Democratic, and his victory was a demonstration of his popularity with the people.

At the time of his death, Mr. Blessing was the president of the Albany Steam Trap Company, and Thomas F. Ryan is secretary and treasurer. Mr. Ryan was associated with Mr. Blessing for 26 years, serving in the capacity of machinist, engineer, superintendent and finally secretary and treasurer of the company.

He is thoroughly familiar and conversant with all phases of the business and it will be continued under his management.

National Association of Jobbers of Wrought Iron and Fittings

The first annual convention of the National Association of Jobbers of Wrought Iron and Fittings was held at the Fort Pitt Hotel, Pittsburg, March 14, 15 and 16. The attendance figures ran up to 160 and the various sessions were characterized by a degree of enthusiasm that showed the wide interest in the movement and the success it has already achieved.

The convention was called to order by Vice-President C. H. Simmons of New York, in the absence of President A. E. Ford, who was kept away by illness. The president's address, which was read, reviewed the organization of the association and the many obstacles that were overcome in its formation. It then went on to describe the work done by the various committees looking towards closer coöperation between the manufacturers and the jobbers.

The report of the secretary showed a membership of 193 representative houses.

The second day of the session was spent at the works of the National Tube Company at McKeesport and on the following day a special trip was made to the plant of the Youngstown Sheet & Tube Co., at Youngstown, Ohio.

All of the officers were re-elected as follows:

President, A. E. Ford, Ford & Kendig Co., Philadelphia; first vice-president, C. H. Simmons, John Simmons Co., New York; second vice-president, O. F. Felix, Pittsburg Supply Co., Pittsburg; treasurer, C. G. Cornell, Jr., Cornell & Underhill, New York; advisory secretary, T. James Fernley, Philadelphia; secretary, Thomas A. Fernley, Philadelphia.

Members of executive committee: (to serve one year) J. P. Hartnett and E. G. Cuyler; (to serve two years) H. R. Boynton and F. M. Sheldon; (to serve three years) Samuel H. Moon and C. V. Kellogg.

By unanimous vote it was decided to hold the next annual convention of the association in Cleveland.

National District Heating Association

The National District Heating Association will hold its second annual convention in Toledo, Ohio, Wednesday, Thursday and Friday, June 1, 2 and 3, 1910.

Papers upon the following subjects will be read and discussed at the convention: Radiation, Factors that Enter into the Determination of Costs in Central Station Heating; Description of a Modern Hot Water Heating Station; Advantages of Steam over Hot Water; Advantages of Hot Water over Steam; A Central Station Operated Purely as a Heating Station without the Adjunct of Electricity or Other Products; Costs; and five other papers, the subjects of which will be announced later.

The association has increased its membership 300% since the last convention held in Columbus in November, 1909, and as this is the only association in the United States devoted to central station heating plants, great interest is being manifested in its work.

Headquarters during the convention will be at the Hotel Boody, where space will be provided for exhibits. An elaborate programme of entertainment for the ladies as well as for the members and guests is being arranged for. The secretary of the association is D. L. Gaskill, Greenville, O.

New Publications

An Appeal to Architects and Builders is the title of an interesting pamphlet, published by the Southern Department of the Home Insurance Company, New York, and containing a plea, based on exhaustive figures and other data, for the use of incombustible materials for walls and roofs and for substantial chimneys and safe heating arrangements. Taking as an example a two-story building, to be occupied as a dwelling, store or a factory, 25 ft. front by 35 ft. deep,

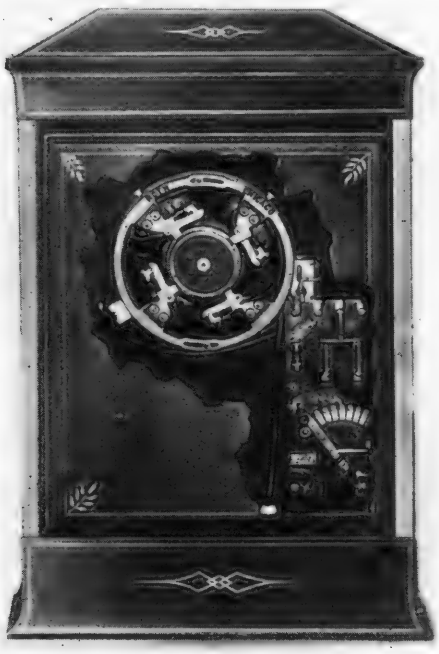
estimates are given from a number of builders in different parts of the country, principally south, covering the walls, the roof, one chimney and probable depreciation of walls and roof for different materials. Average figures are given, the whole forming a most comprehensive comparative exhibit.

NEW DEVICES

A Self-Contained Ventilating Machine.

A machine that has been developed to meet the demand for a positive means of providing ventilation without installing a large built-in system with a central plant, is illustrated in the accompanying photographs. The machine is a separate unit and is designed to be installed directly within the area to be ventilated.

The capacity of the machine is over 100,000 cu. ft. of fresh air per hour, delivered directly into the room. The air is brought into the machine at the bottom or through an opening cut into the iron casting which forms the base. The air supply duct is built from the machine to the best place to secure the outside fresh air. This may be through a panel at the top or bottom of a window, or through an opening in the wall, skylight or floor.



INTERIOR VIEW OF GARNER VENTILATOR, SHOWING DIRECT-CONNECTED MOTOR AND SPEED CONTROLLER

INTERIOR VIEW OF GARNER VENTILATOR, SHOWING SIROCCO FAN AND PRESSED STEEL RADIATOR

The air in entering the machine passes over the pressed steel heating coils which are connected with the steam heating plant of the building. By this means, the fresh air may be made comfortable in temperature during the cold weather when it is impossible to ventilate properly with cold air. Just before leaving the machine, the fresh air passes through a very fine wire cloth screen which removes the dust and dirt. This screen may be easily taken out and cleaned. The fresh air enters the room from the top of the machine in an upward current, in order to avoid draughts.

The whole front of the machine is a door, which when opened, allows easy access to the motor, oiler and speed controller. The motor is of a slow speed type, direct-connected and designed especially for this machine with a view of making it practically noiseless in operation.

The apparatus is manufactured and sold by the Garner Ventilating Company, H. B. Shontz, Manager, 140 Liberty street, New York.

Trade Literature

Standard Recording Thermometers are the subject of a folder catalogue, issued by the manufacturers, the Standard Thermometer Co., Boston, Mass., and containing full directions for using the various types of these instruments. The growing use of recording thermometers for determining the purity of air in buildings by comparisons of the temperature at various points is bringing these de-

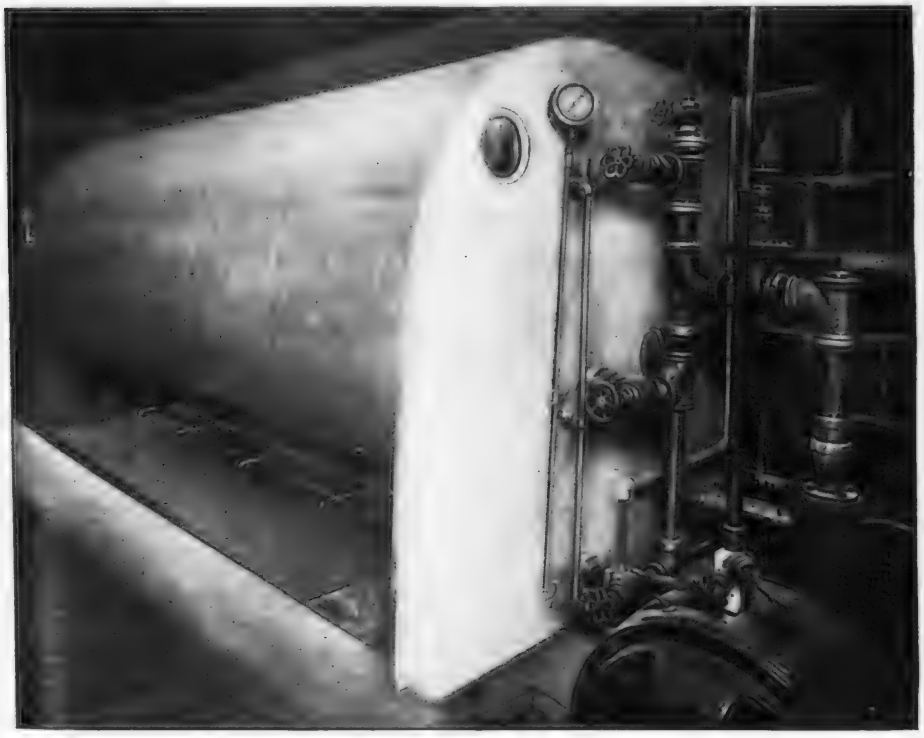
vices into wide use by heating and ventilating engineers and the recording thermometers are proving especially

STANDARD RECORDING THERMOMETER

effective in insuring the operation of a heating and ventilating system on the lines on which it was designed to operate.

McCreery Concrete Air Purifier and Humidifier, a new form of construction advocated by a committee on air washers appointed by the American Society of Heating and Ventilating Engineers, has been brought out by the McCreery Engineering Co., Detroit and Toledo. The washer is built on the lines recently adopted by the company and is equipped with piston spray control. The outside surface is of concrete, making the washer practically indestructible and suitable for use as a permanent building fixture. This new apparatus is illustrated and described in circular matter issued by the company.

Royal Safety Sectional Steam and Water Heaters with Down Draft Grate, made by Hart & Crouse Co., Utica, N. Y., have lately been placed upon the market. The special features of this type of heater, due to the down draft construction, are the elimination of smoke and its adaptability for using cheap soft coal. With the down draft grate the smoke and gases pass downward through the body of the fire where the gases are fully ignited and a perfect combustion is obtained. In addition to the water grate, the heater is equipped with a rocker grate below the water grate. Any fuel not burned on the upper grate is consumed on the lower one. An interesting point with this type of construction is that a deeper fire can be kept than in upward draft firing and the fire can be held better over night. Moreover, the ash pit, which is converted into direct fire surface, together with the water grate, offer new



McCREERY CONCRETE AIR, PURIFIER AND HUMIDIFIER

and additional heating surface and give more heating power to the boiler. The grate being in two halves, can be introduced through the base door of the boiler. All connections, however, are on

ROYAL SAFETY SECTIONAL STEAM HEATER WITH DOWN-DRAFT GRATE

the sides outside of the boiler, so that there is no chance for a leak in the grate connections. A full series of steam heaters and water heaters of the down draft construction are listed, the steam heaters being made in 30 sizes, ranging from 1350 cu. sq. ft. to 13,000 sq. ft. capacity and the hot water heaters in 24 sizes, from 2250 sq. ft. to 14,000 sq. ft. of radiation capacity.

Efficiency of a Harrison Aertube Heater.

In a test recently made by M. F. Thomas in trying out several different types of oil burners, some interesting figures were obtained regarding the efficiency of the Harrison aertube heater, manufactured by the Harrison Engineering Co., New York. These tests were not run to determine the efficiency of the heater, and, therefore, no attempt was made to get exceptionally good results. The aertube heater is made up of 4-in. cast-iron tubes connected at each end into headers and placed over the furnace in which the fuel is burned, the hot gases passing among the tubes through which the air for heating is forced by a fan. The heater tested consisted of four sections of 32 tubes each, making a total heating surface of 547 sq. ft., the tubes being 48 in. between tube sheets.

The air for the oil burners was supplied under a pressure of 17.3 oz. per square inch and the oil pressure was about 14 oz. per square inch. From the heater tubes the air was exhausted by a 110-in. steel plate fan, operating at about 250 R. P. M. The velocity of the air was measured by an anemometer placed in a casing around the inlet side of the heater. It entered with an average temperature of 74°, and was discharged from the heater at 120.7°, the rise in temperature being 46.7°.

The results of the various computations may be summarized as follows:

Volume of air at 74° = 23,350 cu. ft. per min.

Rise in temperature 74 to 120.7 = 46.7 F.

$$\text{Heat delivered} = \frac{23{,}350 \times 46.7}{56} = 19{,}470 \text{ B. T. U. per min.}$$

Oil consumed per min. (at 7 lbs. per gallon) = 1.13 lbs. per min. and 19,740 B. T. U. per min.

Heat supplied = $1.13 \times 19{,}740 = 22{,}300$ B. T. U. per min.

$$\text{Efficiency} = \frac{19470}{22300} = .872 = 87.2\%.$$

$$\text{Rate of heat transfer} = \frac{19470 \times 60}{547} =$$

2,135 B. T. U. per sq. ft. per hr.

Average velocity of air through tubes computed from mean temperature = 2,335 ft. per min.

In commenting on this test, Mr. Thomas stated that the ultimate efficiency should have been higher than the figures given here because the temperature was increasing slowly at the time the readings were made.

A Central Steam Heating Plant Proposed in Winnipeg

Consul-General John E. Jones submits the following report upon the prospective formation of a company in Winnipeg for constructing an underground steam-heating plant in that Canadian city:

The company's franchise, submitted for ratification to the present Manitoba legislature, provides for supplying steam or hot water for heating purposes and compressed air in vacuum for power purposes. The company, which has undertaken to finance the scheme if the franchise is ratified, agrees to spend $100,000 within a year from the time active work upon the plant is commenced.

The boiler plant will probably be located on the bank of the Red River, convenient to the business section of the city. It will be of 5,000 horse-power and will deliver steam underground just as gas is delivered, operating in the central part of the city.

The company expects that its plant, fully equipped, will represent an expenditure of over $1,000,000.

TRADE AND MISCELLANEOUS NOTES

Coming Events

May 31 - June 6, 1910. Spring meeting of the American Society of Mechanical Engineers at Atlantic City, N. J. Headquarters at the Marlborough-Benheim Hotel.

June 1, 2 and 3, 1910. Second annual convention of the National District Heating Association, at Toledo, Ohio. Headquarters at the Hotel Boody.

June 13, 14, 15 and 16, 1910. Twenty-second annual convention of the National Association of Master Steam and Hot Water Fitters at Atlantic City, N. J. Headquarters at the St. Charles Hotel.

June 20-July 6, 1910. Detroit Industrial Exposition at Detroit, Mich.

June 28, 29 and 30, 1910. Twenty-eighth annual convention of the National Association of Master Plumbers at Chicago. Headquarters at the Congress Hotel.

July 26-29, 1910. Joint meeting of the Institution (British) of Mechanical Engineers and the American Society of Mechanical Engineers at Birmingham and London, England.

Deaths.

Archibald M. Maddock, president of the Thos. Maddock Sons Co., Trenton, N. J., manufacturers of pottery, died March 25, 1910, of appendicitis at the McKinley Hospital in Trenton. He was one of the leading pottery men in the United States, and had been connected with the business since 1878, when he became associated with his father in the business of Millington, Astbury & Maddock. He was 54 years old. A widow and four children survive him.

Richard C. Oliphant, president of the Trenton Malleable Iron Co., Trenton, N. J., died March 4 in his 58th year. He came from a family of iron manufacturers and had been engaged in the business during most of his business career.

Miscellaneous Notes

Detroit will hold an industrial exposition June 20 to July 6 under the auspices

ENGINEERS AND STEAMFITTERS REQUIRE GOOD TOOLS

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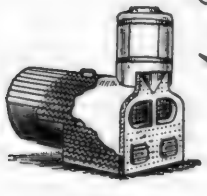

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of the local Board of Commerce. The exposition grounds will be located on the Detroit River, where a large exposition building is being built. Facilities will be provided for upwards of 300 exhibits.

Boynton Furnace Co., New York, has issued the first number of a new house organ known as "Boynton's Magazine." It is edited by David Gibson and is devoted to the company's products as well as to items of general interest to the steam-fitter, plumber and tinsmith. It is sent free to those asking for it.

Building Operations for February in 48 cities show a decrease of 18% over those for the corresponding period last year. Among the cities showing increases are Buffalo, Newark, Washington, Chicago, Cincinnati, Cleveland, Detroit, Kansas City, New Orleans and Seattle. Cities reporting decreases include New York, Philadelphia, Pittsburg, St. Louis and San Francisco. In New York the figures for February, 1910, are $11,906,685 as against $22,145,120 for February, 1909. In the other cities the changes were comparatively slight.

Maine Plumbing, Steam and Metal Salesmen held their annual banquet March 14 at the Riverton Park Casino. Previous to the dinner a business meeting was held with President Charles R. Nelson in the chair. At this meeting the following officers were elected for the ensuing year: President, J. Warren Chase; first vice-president, C. S. Mallard; second vice-president, George W. Paul; third vice-president, Byron E. Near; secretary-treasurer, William F. Snow. Among the speakers at the banquet were Ellsworth F. Hayden, C. S. Mallard, Will C. Miller, J. M. Griffiths and A. E. Campbell.

John R. Allen, professor of mechanical engineering at the University of Michigan, Ann Arbor, Mich., has been appointed principal of a new engineering school to be established at Robert College, Constantinople, Turkey. The school is the outcome of a bequest of the late John Stewart Kennedy, of New York. Prof. Allen will leave for his new post at an early date.

Federal Furnace League, Philadelphia, announces the appointment of Dr. William F. Colbert, of Philadelphia, as the League's lecturer, to carry on the work of P. H. McCarthy.

New York.—As the result of an agreement among the employers of New York City not to employ steam fitters "directly or indirectly through sub-contractors or otherwise" belonging to the steam fitters' union, the matter was brought to the attention of the District Attorney by the steam fitters' counsel, conspiracy being charged. The Grand Jury, however, in spite of direct instructions from Judge Rosalsky, failed to find an indictment against the Building Trades Employers' Association, which was responsible for the blacklisting order. The point was made by the employers that the steam fitters' union went on strike after their withdrawal from the general arbitration treaty which has prevailed among the building trades in New York for several years.

Aberdeen, S. D.—A franchise has been granted S. S. and George Gilbourne, giving them the right to use the city's streets for laying steam heating mains for furnishing heat to any part of the city. The duration of the franchise is 25 years.

Minneapolis, Minn.—The Northern Heating & Electric Co., St. Paul, Minn., announces that it will renew its application to the city council for a franchise in Minneapolis, the delay being due to the death of the company's president, L. L. C. Brooks.

Anderson, Ind.—At the special city election on the proposition of giving the city council the power to install a municipal heating plant to supply the new high school building with heat, the vote

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SAVES TOOLS
also time and fittings. You won't break your tools on taking down pipe connections if Dixon's Compound is used. Write for free sample
Joseph Dixon Crucible Co. Jersey City, N. J.

"THE POTTER" MESH SEPARATOR
OR BOILER DRY-PIPE
DRY STEAM—SAFETY—ECONOMY
POTTER SEPARATOR CO., Newburgh, N.Y. N.Y. OFFICE: 39 Cortlandt St.

was 971 to 564 against the proposition. As a result the high school building will be equipped with an independent heating system.

Municipal Heating Co., Syracuse, N. Y., has applied to the city council for a franchise to permit it to transmit electricity through streets where it has steam mains. The company states that its pipes, mains and connecting apparatus have deteriorated and that much of it must be replaced with new material.

Chicago.—Charges against School Architect Dwight H. Perkins preferred by the Chicago Board of Education allege incompetency in regard to the designing of eight school buildings and extravagance in connection with six school buildings. Hearings were commenced before a special trial committee of the Board of Education.

American Institute of Chemical Engineers will hold its summer meeting at Niagara Falls, June 22 to 24.

F. H. Stevens, formerly central station heating engineer for the American District Steam Co., will hereafter represent Evans, Almirall & Co., of New York, in its department of central station heating. The Chicago office of Evans, Almirall & Co. is at 1208-1210 Monadnock Building.

Technical Publicity Association, New York, held its sixth annual meeting April 14 at the National Arts Club. Following the election of officers, the members and guests sat down to a dinner, following which the evening was devoted to a discussion of the subject of "How Technical Products May Be Exploited in General Magazines."

William Kent, president of Industrial Engineering and the Engineering Digest, delivered an address on "Engineering and Common Sense" at the regular meeting of the Brooklyn Polytechnic Student Section of the American Society of Mechanical Engineers, April 9, at the institute chapel in Brooklyn.

Manufacturers' Notes

McCrum-Howell Co., New York, manufacturers of the Richmond line of heaters, has had its recent issue of stock listed on the Chicago stock exchange. The preferred stock sold at 100 and the common stock at 50.

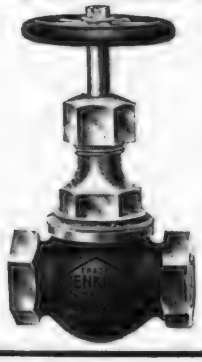
Massachusetts Fan Co., Watertown, Mass., is supplying 20 fans to the new Gimbel store building, New York. These fans are from 50 to 160 in., motor driven, and used in connection with tempering coils and reheaters.

American Radiator Co. is adding a large one-story warehouse to its Standard plant at Buffalo. The Atlanta office of the American Radiator Co. has been removed to Birmingham, Ala.

Federal-Huber Co., the consolidation of the Henry Huber Co., New York, with the Federal Co., Chicago, manufacturers of plumber supplies, has commenced a friendly suit for a temporary receiver for the purpose of securing a satisfactory appraisal of the assets of the two interests, for the purpose of distributing the stock equitably under the consolidation contract.

A. W. Cash, Newark, N. J., manufacturer of the Cash regulating valve and other specialties, has sold his patent rights on his specialties, including machinery, tools, etc., to the H. Mueller Mfg. Co., Decatur, Ill. The H. Mueller Mfg. Co. will establish a large department for the manufacture of the Cash regulating valves and other engineering specialties under the personal supervision of Mr. Cash.

Keller Mfg. Co., Philadelphia, has purchased the business of the W. Pressinger Co., of New York, its general eastern distributor and distributor for Michigan. This territory will hereafter be handled direct by the Keller Mfg. Co. The officers of the Keller Mfg. Co. are: President, Julius Keller; vice-presidents, W. P. Pressinger, William H. Kohler, and S. W. Prince; treasurer, Francis J. Rue; secretary, C. S. Bell.



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We shall be glad to send catalog on request.

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NEW YORK BOSTON PHILADELPHIA CHICAGO

Novelty Iron Co., Canton, O., held its annual meeting recently at which W. E. Sherlock retired from the office of president and director, being succeeded by Sol. Toronski. J. W. Steiner succeeds D. R. McCollum as vice-president and H. E. Sherlock was elected secretary and treasurer.

Pressed Radiator Co. of America, Pittsburg, Pa., announces the removal of its New York offices to larger quarters in the Fourth Avenue Building at Fourth avenue and 27th street.

N. O. Nelson Mfg. Co., St. Louis, Mo., announces an increase in its capital stock from $1,000,000 to $1,500,000. The assets of the company are reported as $2,447,842 and the liabilities, $875,256.

Ohio Blower Co., Cleveland, O., has purchased a site covering two and one-half acres in the centre of Cleveland, where it will build a new plant. The company was organized about eight years ago by D. K. and J. D. Swartwout, with $50,000 capital. The present officers are: President and treasurer, D. K. Swartwout; vice-president, J. D. Swartwout; secretary, H. H. Lind; superintendent, W. J. Foster.

American District Steam Co., North Tonowanda, N. Y., is building a new foundry and machine shop two stories in height, 240 by 250 ft.

Harrison Engineering Co., New York City, has been awarded the contract to install a complete heating and ventilating system consisting of Harrison aer-tube heaters and fans in the new 7-story loft building to be built for A. Lowenbein's Sons at 586 Fifth Ave., New York.

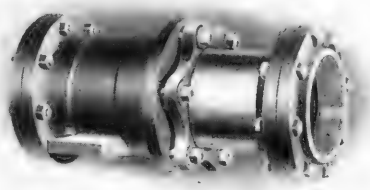
New Firms and Business Changes

Chandler-Boyd Supply Co., Pittsburg Pa., is a new steam and mill supply house, with quarters at the Terminal Warehouses. The company has been appointed special jobbers in the Pittsburg district for the products of the Pittsburg Valve & Fittings Co. President, S. M. Chandler; vice-president Marcus Boyd.

Frankfort Brass Mfg. Co., Frankfort, Ind., has been organized to engage in the manufacture of radiator valves. President, John A. Johnson; general manager, George A. Burgiss. Both of the officers were formerly connected with the Findelsen & Kropf Mfg. Co., of Chicago.

New Incorporations.

Egyptian Heat and Power Co., Sumner, Ill. Capital, $10,000. Incorporators, J. G. Beals, E. M. Hinshaw and J. F. Hinshaw.



High Grade Expansion Joints

We manufacture expansion joints for inside, outside and underground work. In all sizes from 1 to 30". Our experience covers a period of over thirty years. Let us figure on your requirements.

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American District Steam Co.

Lockport, N. Y. Chicago, Ill

H. W. JOHNS-MANVILLE CO.

ASBESTOS AND MAGNESIA COVERINGS ROOFINGS, PACKINGS, FIRE-PROOF AND COLD STORAGE INSTALLATION, ELECTRICAL AND PLUMBERS' SUPPLIES, ETC.

SEND FOR CATALOG - OFFICE AND WAREHOUSE IN EVERY LARGE CITY.

Kernchen Improved Ventilator Co., Chicago, capital, $25,000, to conduct mercantile and mining business in ventilating apparatus. Incorporators: Alfred Livingston, John M. Pollock and John W. Rainer.

Selzer Heating Co., Akron, O., capital, $20,000. Among the principals is W. J. Selzer.

Mosimann Plumbing Co., Highland, Ill., capital, $10,000, to conduct a heating and plumbing business. Incorporators: Adolph P. Mosimann, C. Herbert Stocker and Landolin Houseman.

Rhode Island & Connecticut Heating Co., Kittery, Me., to manufacture heating supplies. President, Horace Mitchell; treasurer, Hiram Thompson, both of Kittery.

Ohio Domestic Heater Co., Toledo, O., capital, $20,000, to manufacture heating goods. Incorporators: May Heckert Dye, L. A. Heckert, J. W. Cable, Sanford J. Dye and N. J. Heckert.

W. D. Delahunty & Co., Decatur, Ill., incorporated to conduct a heating, plumbing and electrical business. Incorporators: William D. Delahunty, Theodore A. Brinkoetter and Charles A. Gouker.

William Sullivan Co., Chicago, capital, $5,000, to conduct a heating and ventilating business. Incorporators: William Sullivan, John E. Hannon and Henrietta J. McKenna.

Hub City Heating & Lighting Co., Aberdeen, S. D., incorporated, to conduct a heating, plumbing and electrical engineering business. President, P. B. Poore, Minneapolis.

Alma Heating Co., 113 Beekman St., New York, capital, $10,000, to manufacture and install steam and hot water heaters and furnaces.

E. E. Robinson Co., 203 State St., Lafayette, Ind., incorporated to conduct a heating, plumbing and hardware business.

McFadden Plumbing & Heating Co., Newark, N. J., capital, $100,000, to conduct a heating and plumbing contracting business. Incorporators: E. E. McFadden, H. M. McFadden and J. A. McFadden.

Consolidated Ventilating Co., Rochester, N. Y., capital, $5,000, to manufacture ventilating apparatus. Incorporators: Freeman C. Allen, Philip C. Tucker and Luther B. Elliott.

Instantaneous Heater & Specialties Co., Pierre, S. D., capital stock, $65,000.

Hart Heating Co., Oakland, Cal., capital, $50,000, to engage in a heating and plumbing contracting business. Incorporators: Charles Hart, P. L. Sternberg and C. W. Keith.

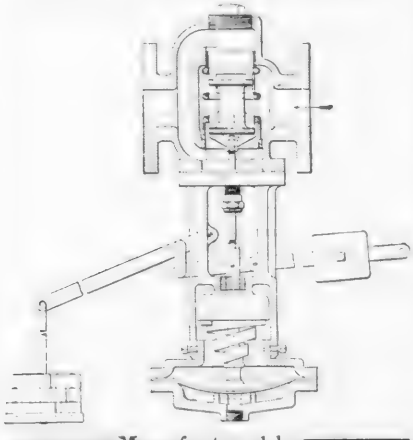
Franklin Plumbing & Heating Co., Hartwell, O., capital, $10,000. Incorporators: Henry G. Franklin, Edith J. Hill, Charlotte A. Franklin and James A. Hill.

Swords Bros. Co., Rockford, Ill., capital, $20,000, to conduct a heating and plumbing business. Incorporators: T. E. Swords, John L. Swords and Ira Dougherty.

New Richmond Hardware & Plumbing Co., New Richmond, Wis., capital, $10,000. Incorporators: Van H. Armstrong, Asher D. Armstrong and H. C. Shern.

Johnstown Engineering Co., Johnstown, Pa., incorporated to conduct a

WATERS
Reducing Valves
for steam heating purposes a specialty.
Also valves for vacuum heating systems.



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DEMONSTRATION PLANT
which illustrates the most advanced ideas as applied to **Heating Systems,** especially in connection with Central Generation and Distribution of **Fuel Gas, Electric Current** and **Heat**
In this plant over 80 per cent. of the lower cost heat units is applied in work
Write for appointment for visit
TORRIDOOR POWER, LIGHT & HEATING CO.
94 Prospect Street - - - - EAST ORANGE, N. J.

heating and ventilating and plumbing contracting business. President, John N. Horin; vice-president, W. W. Campbell; secretary, Robert A. Judy; treasurer, Moses Alwine; general manager, Henry L. DeWitte.

Cleland-Peck Co., Lynchburg, Va., capital, $25,000, to conduct a heating and plumbing business. President, E. A. Cleland; vice-president, W. T. Peck; secretary and treasurer, J. R. Cleland.

Modern Plumbing & Heating Co., Houston, Tex., capital, $10,000. Incorporators: J. E. Fisher, H. H. Fisher and C. A. Fisher.

Contracts Awarded

Iowa Mfg. Co., Oscaloosa, Ia., installing central heating plant at the Oregon state insane asylum at Salem, Ore., for $53,000.

American Warming & Ventilating Co., Pittsburg, Pa., heating and ventilating new public school building No. 7, at Twenty-first and Sassafras streets, Erie, for $16,195.

American Warming & Ventilating Co., Toledo, Oo., heating and ventilating Carpenter street school, Evansville, Ind., for $5,000.

Chatfield & Armitage, Jamestown, N. Y., heating new municipal hospital at that place for $4,215.

Chambersburg Plumbing & Heating Co., Chambersburg, Pa., heating and plumbing new Hotel Washington at that place, for $10,000. The building will contain 46 bathrooms.

Tholen Bros., Leavenworth, Kan., heating and plumbing new Helmers plant at that place.

Hamilton Plumbing Co., Fort Smith, Ark., heating and plumbing new Tuberculosis Sanitarium, in that city, for $8,950.

A. J. Potts & Co., St. Peter, Minn., remodeling the steam heating plant at the State Hospital at St. Peter for $32,000.

G. S. Blodgett Co., Burlington, Vt., heating and ventilating State House at Montpelier for $31,039. A hot blast system will be installed.

Fitzpatrick & Koepfner, Columbus, O., heating and plumbing U. S. Government building at Toledo, for $30,890.

John Mannix, Jr., Greenville, O., heating and plumbing new St. Clair memorial building for $8,500.

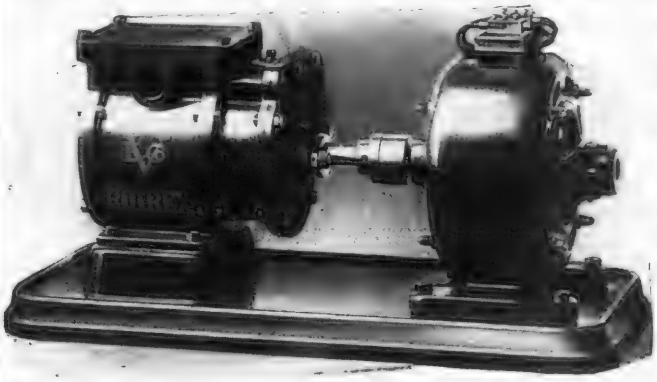
Peck-Hammond Co., Cincinnati, O., heating Non-Sectarian Hospital at Mobile, Ala., for $5,800.

Salina Plumbing Co., Salina, Kan., heating and plumbing new college gymnasium at Manhattan, Kan.

C. A. Richardson, Tacoma, Wash., Heating Franklin School, at that place.

The "ROTREX" System of Vacuum Cleaning

not only insures the complete extraction of **all** dust and dirt but also insures its removal from the rooms and from the premises in the most sanitary manner yet devised.



The "ROTREX" System discharges **the dirt and dust direct to the sewer.**

With the "ROTREX" System there are no unsanitary dust receptacles or separating tanks of any kind.

Every feature of the "ROTREX" System has been brought to the highest point of efficiency.

The "ROTREX" System is noiseless in operation. Its vacuum producing machine delivers the largest volume of air under a given vacuum for the lowest consumption of power. That means highest efficiency of operation combined with greatest economy of operation.

VACUUM ENGINEERING CO. - 114-118 Liberty Street, New York

Branch Offices in all Principal Cities

for $3,716; A. M. Goddard, of Tacoma, has the plumbing contract at $2,450.

John Boyd Plumbing & Heating Co., New York, heating apartment building at Park avenue and 62d street, New York. 8,000 sq. ft. of Kinnear pressed steel radiation will be installed.

Reid, Steward & Blunt, heating and ventilating 4-story brick dormitory for the University of Maine at Orone, Me., for $4,367.

Willey & Calhoun, Portland, Me., heating extension to Normal School at Castine, Me., for $2,539; H. F. Fuller & Co., Portland, Me., have the plumbing contract at $2,262.

Newport Engineering Co., Portland, Ore., central heating plant for the State hospital for the insane at Salem, Ore.

Hanley-Casey Co., Chicago, power equipment, heating, plumbing, electrical and general mechanical equipment for the Stillwater State Prison at Oak Park, Minn. The work will amount to $543,000. Clarence H. Johnston, architect; Charles L. Pillsbury, engineer. The contract was awarded by the State Board of Control of Minnesota.

Business Chances

Washington, D. C.—Sealed proposals will be received at the office of the Supervising Architect, Treasury Department, for the following-named work:

Until April 25, 1910, for the extension, etc., except elevator (including plumbing, gas piping, heating apparatus, electric conduits and wiring) of the U. S. Post Office at Kansas City, Kan.

Until May 12, 1910, for the construction complete (including plumbing, gas piping, heating apparatus, electric conduits and wiring) of the U. S. Post Office at Austin, Minn.

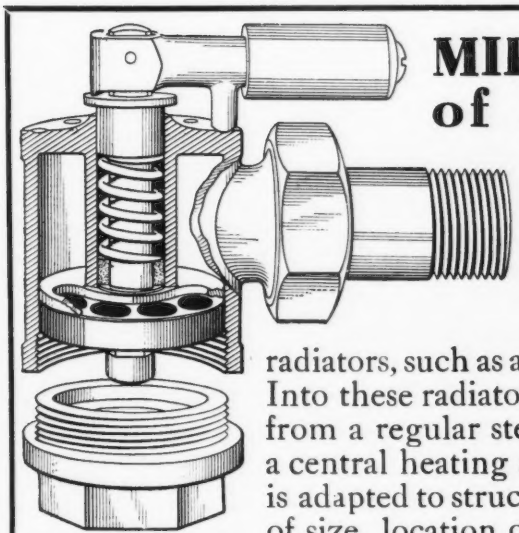
Until May12, 1910, for the construction complete (including plumbing, gas piping, heating apparatus, electric conduits and wiring) of the U. S. Post Office at Appleton, Wis.

Until May 13, for the construction (including plumbing, gas piping, heating apparatus, electric conduits and wiring and standard clock system) of the U. S. Post Office and Court House at Ottumwa, La.

Until May 16, 1910, for the construction (including plumbing, gas piping, heating apparatus, electric conduits and wiring and standard clock system) of the U. S. Post Office and Court House at Shreveport, La.

Trade Literature

Minneapolis Heat Regulator and Time Attachment for controlling the draft dampers of a heater, is described in an

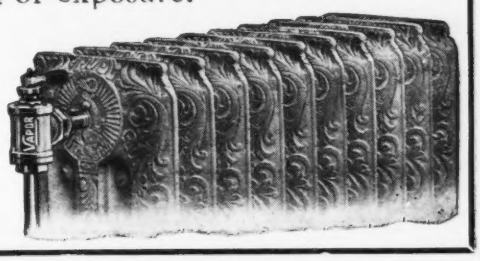


The Quintuple Valve Regulates the Temperature of the Radiator

MILLIONS of FEET of RADIATION

Are now operating on the **Broomell Patented Vapor Heating System** with universal satisfaction.

Broomell's Vapor System distributes heat by means of radiators, such as are used on hot water systems. Into these radiators vapor is conveyed by pipes from a regular steam boiler or heater or from a central heating station. The Vapor System is adapted to structures of every class regardless of size, location or exposure.



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Vapor Heating Company

Broomell's Patent Vapor System

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Boston
79 Milk Street

interesting catalogue, published by the makers, the Electric Heat Regulator Co., Minneapolis, Minn., and sold by Pierce, Butler & Pierce Mfg. Co., Fourth Ave. and 22nd St., New York. The regulator is equally applicable to hot water, steam, hot air and combination heaters. The catalogue contains several views of the interior construction of the device and also comparative records of temperature with and without the regulator, showing the even temperature and consequent economy in fuel obtained through its use. Pp. 20. Size 3½x6 in. (standard).

National Steam Specialty Co., Chicago, whose new address is 12 and 14 South Clinton street, has published its 1910 catalogue of valves and other steam specialties, including a complete line of gauges for various purposes. Pp. 39. Size 5x7 in.

Sylphon Packless Radiator Valves, made by the American Radiator Co., Chicago, are called to the attention of the trade through a circular illustrating an interior of a Sylphon packless radiator valve. A patented metallic bellows, or Sylphon, is enclosed in the bonnet of the valve and the valve stem and stem support are located inside the Sylphon. When the valve is opened and closed the Sylphon contracts and expands, hermetically sealing the valve at all points around the stem.

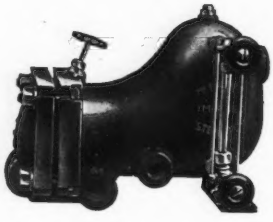
Kieley Steam, Water and Air Specialties, 1910 Edition, is the title of a new catalogue covering the well-known Kieley steam specialties, made by Kieley & Mueller, 34 West 13th street, New York. The catalogue is profusely illustrated and includes full descriptions and price lists. Pp. 100. Size 6x9 in. (standard).

Standard Electric Time Systems, is the title of a new catalogue, published by the Standard Electric Time Co., Waterbury, Conn. The Standard system concentrates the control in a central master clock. The secondary apparatus, located in one building or many, is electrically controlled and shares the precision of the master clock. Included in the catalogue is a phantom view, with description, of the Standard master clock movement together with a variety of views of master clocks and secondary clocks. Pp. 72. Size 5½x9 in.

Collapsible Steel Horse or Trestle, of special use to contractors and in machine shops, has been placed on the market by the S. M. Hildreth Co., 2 Rector St., New York. The steel horse is made of

McDaniel Improved Steam Trap

WILL DO THE WORK



When you need a Steam Trap buy one you know will work. With a McDANIEL we take all the chances. Don't pay until you are satisfied. We have been 25 years manufacturing Steam Traps and know there is no better trap made. May we send you one for trial?

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angle iron, in several lengths and heights and is very rigid and strong. Its collapsible feature permits the legs to be folded up when it is not in use and the device can be stored in a small space.

Power Electric Vacuum Cleaner System, manufactured by the Power Electric Co., Canton, Ohio, is an interesting apparatus designed not only to remove dust and foul air, but at the same time to supply fresh air. The Power system is made for permanent installation. The machine can be used without piping by attaching hose reaching to any part of the building, or, if required, the machine maybe set on wheels. The attachments are made of aluminum to secure the advantage of lightness. The Power machine acts on the centrifugal principle and has but two bearings in its construction. Special emphasis is laid on the low cost of operating this apparatus, which at the usual price for electric current, is given as 3 cents per hour.

Writes Black, Copies Purple, is a circular published by the Joseph Dixon Crucible Co., Jersey City, N. J., describing Dixon's Eterno, the indelible pencil. The pencil is designed to take the place of a pen, being especially useful to the hurried business man. It serves the ordinary purposes of a black lead pencil, writing such a dark purple as to be practically black. The lead is described as of peculiar smoothness and toughness. Dixon's Eterno pencil is being sold through the stationers.

Advertising and Its Service, an article discussing the economic theory of advertising, especially as regards the engineering and mechanical industries, which appeared recently in the New York Evening Post, has been reprinted in pamphlet form by the authors, the Geo. H. Gibson Co., New York. It is shown that, contrary to current academic opinion, properly directed advertising reduces the cost of distribution of goods by providing the salesmen with a greater number of selling opportunities in a given territory and in a given time. It performs the preliminary but necessary work of informing and educating the prospective user as to the nature, possibilities and profitableness of improved machinery, thereby hastening its adoption. Greater sales, brought about through advertising, usually make possible cheaper production, thereby benefiting the community as a whole, while competitive advertising, which seems to be the especial bugaboo of socialistic writers, is also a benefit, inasmuch as it stimulates to improvements in the design of apparatus, and advertising is necessary in order that such improvements may meet with a prompt and adequate reward. A secondary benefit is derived from the fact that

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Standard Recording Thermometers

As effective as the carbon dioxide test and automatic

Write us for the results of exhaustive experiments showing simplicity of arrangement and reliability of data secured.

An essential feature of a modern Heating and Ventilating System

Manufactured by the

Standard Thermometer Co.

Clifton and Shirley Sts.

Boston, Mass.

a consistent policy of advertising lessens the capital risk when new enterprises are undertaken and insures permanency to a business. In other words, advertising does not become an added burden on the consumer. Copies of this pamphlet may be had from the Geo. H. Gibson Co., advertising engineers, Tribune building, New York.

Let Us Figure a Little is the title of an attractive folder being distributed by The Green Fuel Economizer Co., Matteawan, N. Y., from whom copies may be obtained on application. The folder is gotten up to represent a common school slate and tells of numerous textile mills where Green economizers are producing large savings. The actual saving in dollars is figured out for a typical plant and the computations set down in the form of a balance sheet showing convincingly the yearly net profit per horse power to be obtained from a Green fuel economizer.

Darling Process of Making Gas from Oil is described in detail in a handsome catalogue published by the Smokeless Heat & Power Co., Cleveland, O. The Darling process produces gas from the mixture of oil and tar with the application of heat. The product is a fixed gas of high efficiency for both illuminating and heating. Its combustion is said to be perfect, and whether used in an internal combustion engine or otherwise, leaves no carbon or other deposits. This gas can be made having from 500 to 1,400 B. T. U. per cubic foot and from 15 to 25-candle power, depending on the quantity of oil used. At a cost of 2½ cents per gallon for oil, the gas may be produced at a cost of 25 cents per 1,000 ft., averaging 600 B. T. U. per cubic foot. Photographic views, as well as plans and sectional drawings of the Darling producers, are included in the catalogue, some of them being reproductions of typical installations. Size 6 x 9 in. (standard). Pp. 28.

Nash Gas Engines, made by the National Meter Co., New York and Chicago, were among the interesting exhibits at the recent Gas Show in New York. In recently issued circular matter descriptions are presented of direct-connected electric lighting plants, consisting of Nash gas engines, direct-connected to dynamos, which, operating under fluctuating load conditions, are capable of furnishing electric current for less than 30 ft. of gas per kilowatt hour, or 2½ cents. Equipments are also shown of Nash gas engines in combination with dynamos for operating pumps.

Wanted

A man with 20 years' experience in all branches of the heating and plumbing business will be open for proposition June 1st. Best of references. Address, Practical, care of HEATING AND VENTILATING MAGAZINE.

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OF THE STATES OF

MASSACHUSETTS NEW JERSEY
NEW YORK PENNSYLVANIA
VERMONT

INCLUDING NEW YORK AND ILLINOIS
STATE FACTORY VENTILATION LAWS

Comprising all the statutes now in force in this country regulating the ventilation of school and other public buildings

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